Validation Report

Virginia, SPS-1
Task Order 16, CLIN 2
January 30 to February 1, 2007

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1 Executive Summary

A visit was made to the Virginia 0100 on January 30 to February 1, 2007 for the purposes of conducting a validation of the WIM system located approximately 8 miles north of Danville on the US-29 Bypass. The SPS-1 is located in the righthand, southbound lane of a four-lane divided facility. The LTPP lane is one of 2 lanes instrumented at this site. This report discusses the validation of the LTPP lane. The validation procedures were in accordance with LTPP's SPS WIM Data Collection Guide dated August 21, 2001.

This is the first validation visit to this location. The site was installed November 1 to 4, 2006, and was subsequently calibrated by International Road Dynamics/PAT Traffic. This site is located approximately 500 feet downstream from a previous location.

This site meets all LTPP precision requirements except speed which is not considered sufficient to disqualify the site as having research quality data. The classification data is of research quality.

The site is instrumented in both lanes with bending plate WIM sensors and an IRD/PAT Traffic iSINC controller. It is installed in a section of portland cement concrete that is 424 feet long. The WIM sensors are 313 feet from the asphalt to concrete pavement transition. The LTPP Lane is designated as Lane number 1 by the controller.

The validation used the following trucks:

1) 5-axle tractor-trailer with a tractor having an air suspension and trailer with a standard rear tandem and air suspension loaded to 75,750 lbs., the "golden" truck.
2) 5-axle tractor semi-trailer with a tractor having air suspension and a trailer with standard rear tandem and tapered leaf/walking beam suspension loaded to 65,310 lbs., the "partial" truck.

The validation speeds ranged from 42 to 65 miles per hour. The pavement temperatures ranged from 27 to 45 degrees Fahrenheit. The desired speed range was achieved during this validation. The desired 30 degree Fahrenheit temperature range was not achieved.

Table 1-1 Post-Validation results – 510100 – 31-Jan-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-4.7 ± 5.4%	Pass
Tandem axles	±15 percent	-0.1 ± 7.2%	Pass
GVW	±10 percent	-0.8 ± 5.5%	Pass
Speed	±1 mph [2 km/hr]	**0.1 ± 1.4 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0 ± 0.1 ft	Pass

The pavement condition appeared to be satisfactory for conducting a performance evaluation. There were no distresses observed that would influence truck motions significantly. A visual survey determined that there is no discernable bouncing or avoidance by trucks in the sensor area. Discernable bouncing that was observed at the point of the pavement transition 313 feet prior to the scale area appeared to diminish prior to the trucks traversing the WIM scales.

Profile data collected since the site installation does not exist. To our knowledge a site visit to collect profile data has not yet been scheduled. An amended report will be submitted when the profile data is available.

If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 1-2 Results Based on ASTM E-1318-02 Test Procedures

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

This site needs 5 years of data to meet the goal of five years of research quality data.

2 Corrective Actions Recommended

The loop lead-ins should be replaced from the pull box to the cabinet with shielded two-conductor wire to provide grounding and shielding and prevent cross-talking between the loops. This correction is to address a problem currently existing in the adjacent lane.

3 Post Calibration Analysis

This final analysis is based on test runs conducted January 31, 2007 during the afternoon hours and continuing on February 1, 2007 during the morning hours at test site 510100 on the US-29 Bypass. This SPS-1 site is at milepost 12.8 on the southbound, righthand lane of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for the validation included:

1. 5-axle tractor-trailer with a tractor having an air suspension and trailer with a standard rear tandem and air suspension loaded to 75,750 lbs., the "golden" truck.
2. 5-axle tractor semi-trailer with a tractor having air suspension and a trailer with standard rear tandem and tapered leaf/walking beam suspension loaded to 65,310 lbs., the partial truck.

Each truck made a total of 20 passes over the WIM scale at speeds ranging from approximately 42 to 65 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 27 to 45 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 3-1.

As shown in Table 3-1, this site meets all LTPP precision requirements except speed which is not considered sufficient to disqualify the site as having research quality data.

Table 3-1 Post-Validation Results – 510100 – 31-Jan-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-4.7 ± 5.4%	Pass
Tandem axles	±15 percent	-0.1 ± 7.2%	Pass
GVW	±10 percent	-0.8 ± 5.5%	Pass
Speed	±1 mph [2 km/hr]	**0.1 ± 1.4 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.1 ft	Pass

The test runs were conducted primarily during the afternoon hours of January 31st and the morning hours of February 1st, 2007. Temperatures over the course of the test period did not fluctuate by a considerable amount, resulting in a modest range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs by speed and temperature is illustrated in Figure 3-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs.

The three speed groups were divided as follows: Low speed – 42 to 48 mph, Medium speed – 49 to 57 mph and High speed – 58+ mph. The two temperature groups were created by splitting the runs between those at 27 to 34 degrees Fahrenheit for Low temperature, and 35 to 45 degrees Fahrenheit for High temperature.

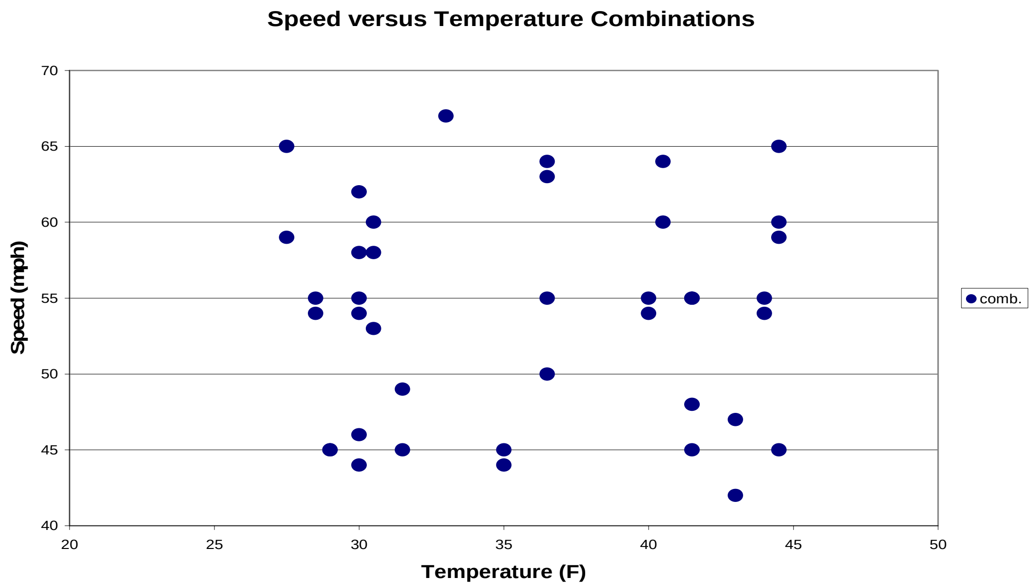

Figure 3-1 Post-Validation Speed-Temperature Distribution – 510100 – 31-Jan-2007

A series of graphs was developed to investigate visually any sign of a relationship between speed or temperature and the scale performance. Figure 3-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. From the figure, it appears that the equipment estimates GVW fairly accurately at all speeds. There appears to be more variability in error at the medium speeds when compared with low and high speeds.

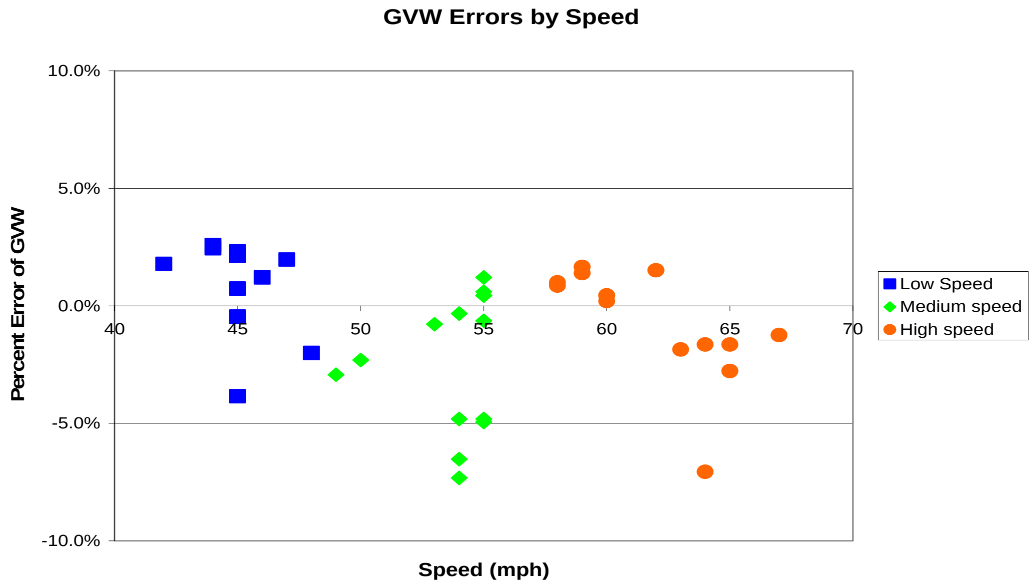

Figure 3-2 Post-validation GVW Percent Error vs. Speed – 510100 – 31-Jan-2007

Figure 3-3 shows the lack of relationship between temperature and GVW percentage error.

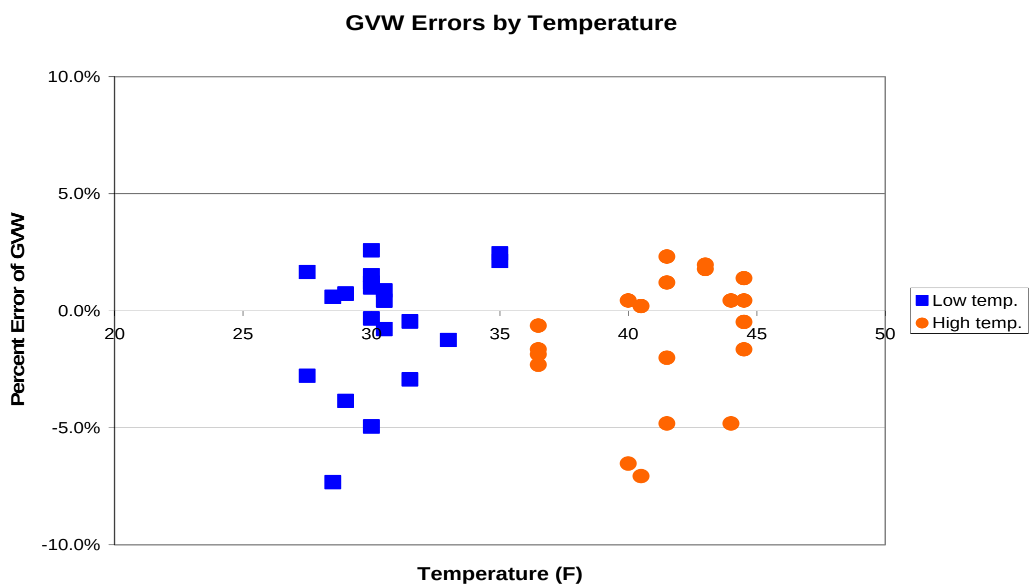

Figure 3-3 Post-Validation GVW Percent Error vs. Temperature – 510100 – 31-Jan-2007

Figure 3-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. The graph indicates that the errors in tandem spacings for the test trucks were not affected by changes in speed.

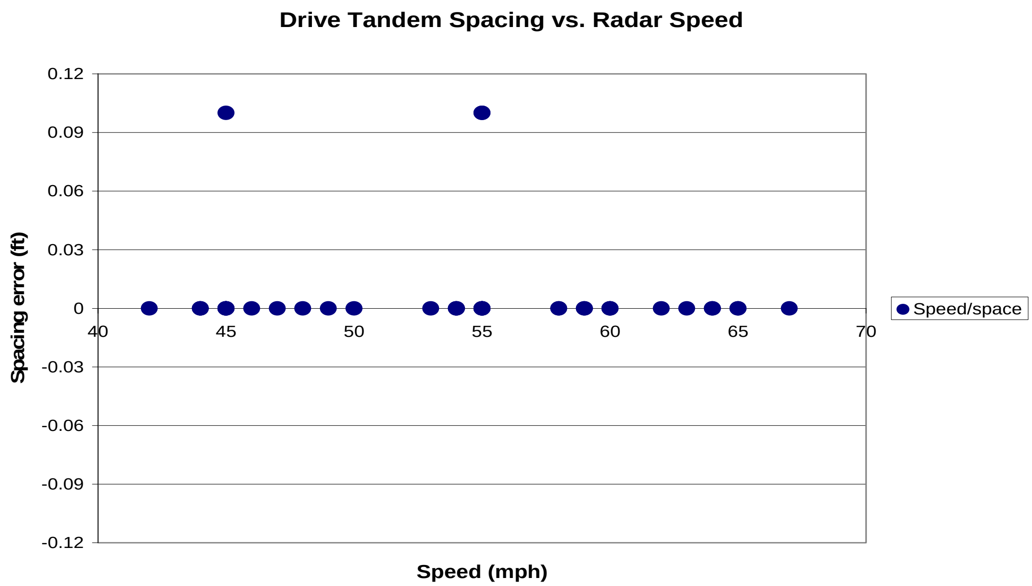

Figure 3-4 Post-Validation Spacing vs. Speed – 510100 – 31-Jan-2007

3.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 27 to 34 degrees Fahrenheit for Low temperature, and 35 to 45 degrees Fahrenheit for High temperature.

Table 3-2 Post-Validation Results by Temperature Bin – 510100 – 31-Jan-2007

Element	95% Limit	Low Temperature 27 to 34 °F	High Temperature 35 to 45 °F
Steering axles	±20 %	-4.3 ± 6%	-5.2 ± 5.1%
Tandem axles	±15 %	0.2 ± 7.2%	-0.4 ± 7.4%
GVW	±10 %	-0.5 ± 5.5%	-1.2 ± 5.8%
Speed	±1 mph	0.3 ± 1.5 mph	0.0 ± 1.4 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

From Table 3-2, it appears that the equipment underestimates GVW and steering axle weights at all temperatures. For tandem axle weights, the equipment slightly overestimates at the lower temperatures and slightly underestimates at the higher temperatures. The variability in error for all weights appears to remain constant over the course of the entire temperature range.

As shown in the following figures, the temperature related trends observed during the pre-validation do not appear in the post-validation results.

Figure 3-5 is the distribution of GVW Errors versus Temperature by Truck graph. From the figure it can be seen that GVW for both trucks is underestimated at all temperatures. Variability in error is higher at the low and high ends of the temperature range.

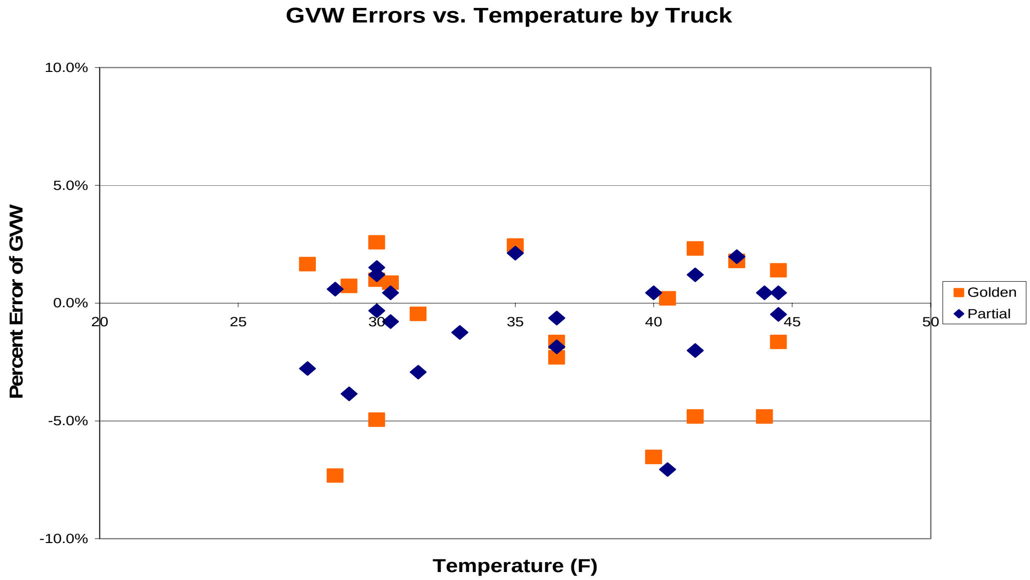

Figure 3-5 Post-Validation GVW Percent Error vs. Temperature by Truck – 510100 – 31-Jan-2007

Figure 3-6 shows the relation between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles.

From the figure, it can be seen that the equipment underestimates steering axle weights at all temperatures. Variability in error is fairly consistent over the entire temperature range. As shown in figure, the temperature related trends on steering axle weights observed during the pre-validation do not appear in the post-validation results. This may be the result of the limited sample size at these temperatures.

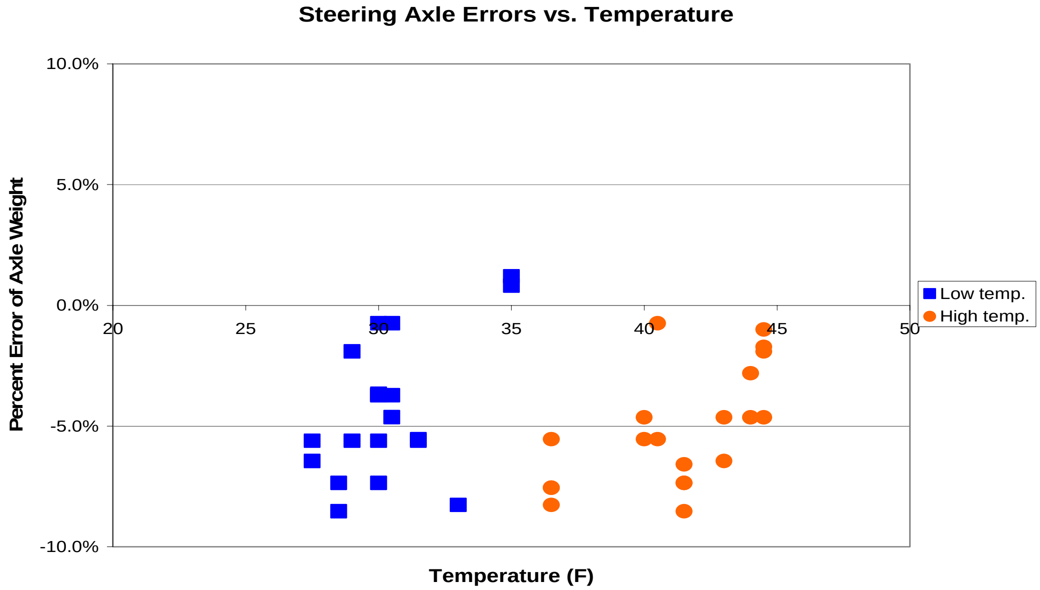

Figure 3-6 Post-Validation Steering Axle Error vs. Temperature by Group – 510100 – 31-Jan-2007

3.2 Speed-based Analysis

The three speed groups were divided using 42 to 48 mph for Low speed, 49 to 57 mph for Medium speed and 58+ mph for High speed.

Table 3-3 Post-Validation Results by Speed Bin – 510100 – 31-Jan-2007

Element	95% Limit	Low Speed 42 to 48 mph	Medium Speed 49 to 57 mph	High Speed 58+ mph
Steering axles	±20 %	-4.1 ± 6.4%	-6 ± 3.9%	-4.3 ± 6%
Tandem axles	±15 %	1.0 ± 6.7%	-1.4 ± 9.1%	0.1 ± 5.7%
GVW	±10 %	0.3 ± 5.4%	-2.1 ± 6.3%	-0.6 ± 5.1%
Speed	±1 mph	0.3 ± 1.4 mph	0.0 ± 1.2 mph	0.0 ± 1.8 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

From Table 3-3, it can be seen that the equipment underestimates steering axle weights at all speeds. For tandem weights, the equipment underestimates at low and high speeds and underestimates at medium speeds. GVW weights are overestimated at low speeds and are underestimated at medium and high speeds. Variability in steering axle errors is lower at medium speeds when compared to low and high speeds. For tandem axles, variability is higher at medium speeds when compared with low and high speeds. GVW error variability is fairly consistent over the entire speed range.

Figure 3-7 illustrates the tendency for the equipment to overestimate GVW at low speeds and underestimate at medium and high speeds for the population as a whole. For the Golden truck, the equipment estimates GVW reasonably well at low and high speeds and underestimates GVW at the medium speeds. Variability is fairly constant over the entire speed range for the population as a whole as well as for each truck individually. Speed data studies conducted from post-visit data have indicated that the 15th percentile speed at this site is 58 mph. This is the low end of the High speed range for this validation.

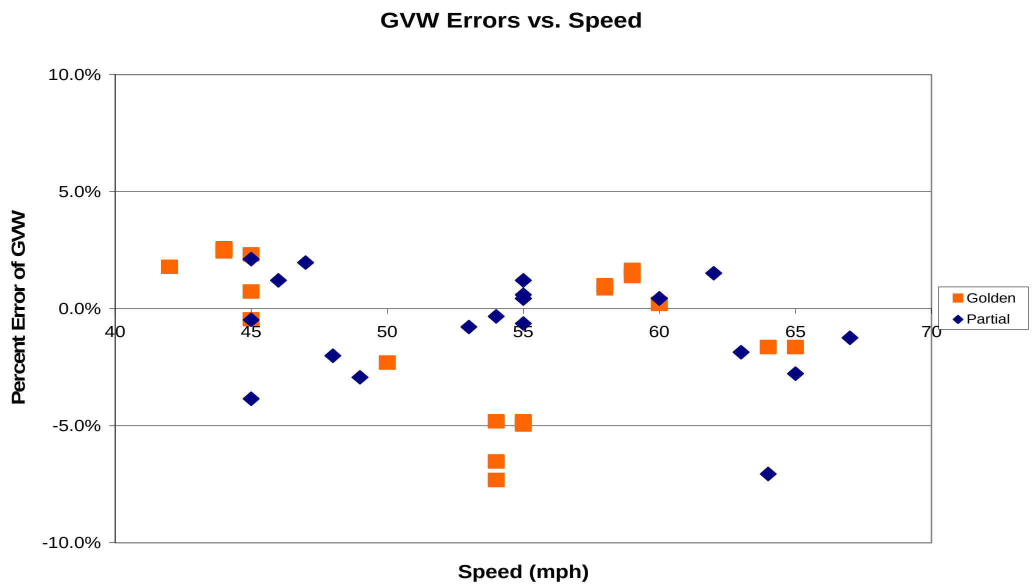

Figure 3-7 Post-Validation GVW Percent Error vs. Speed by Truck – 510100 – 31-Jan-2007

Figure 3-8 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles.

The figure illustrates how the WIM equipment underestimates steering axle weights at all speeds. The variability in error appears to remain constant over the entire speed range.

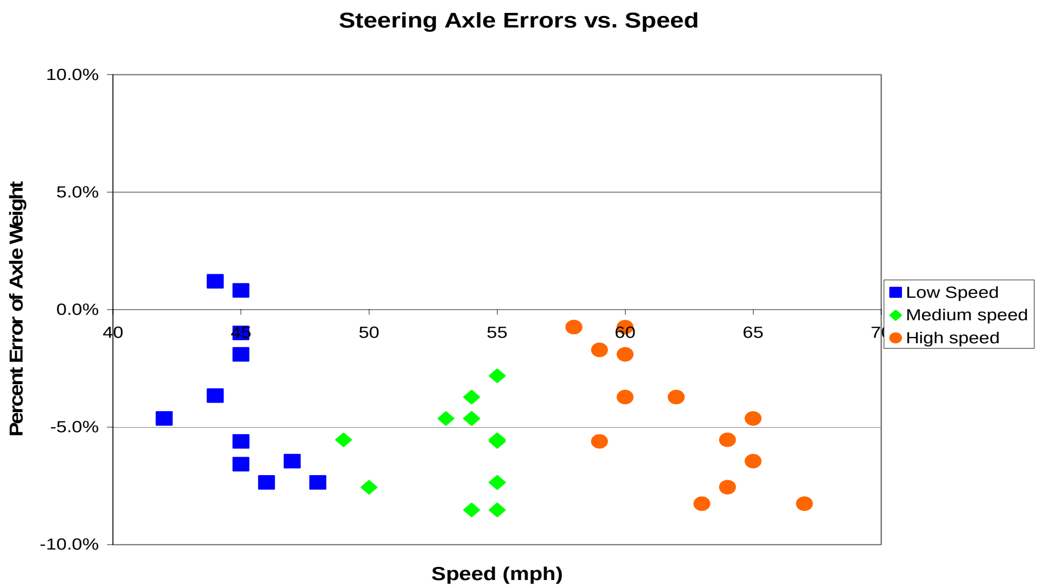

Figure 3-8 Post-Validation Steering Axle Percent Error vs. Speed by Group – 510100 – 31-Jan-2007

3.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. Classification 15 has been added to account for unclassified vehicles.

A post-validation classification validation was not performed since the results of the pre-validation classification and speed study indicated less than 2 percent misclassifications and less than 2 percent unknown vehicles. No changes to the equipment operational parameters were performed between the pre- and post-validation tests.

3.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 criteria for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 3-4 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

4 Pavement Discussion

The pavement condition did not appear to influence truck movement across the sensors.

4.1 Profile Analysis

Profile data collected since the site installation does not exist. A site visit to collect profile data has not been scheduled yet. An amended report will be submitted when the data is available.

4.2 Distress Survey and Any Applicable Photos

During a visual survey of the pavement, discernable bouncing by trucks was observed at the transition point shown in Figure 4-1. It is located approximately 313 feet prior to the WIM scale area. Although not visible to the naked eye, a dip in the pavement at this location may be the cause. The effects of the distress on the dynamics of the trucks appear to diminish prior to the trucks entering the WIM scale area.

Figure 4-1 - Distress at Pavement Transition

4.3 Vehicle-pavement Interaction Discussion

A visual observation of the trucks as they approach, traverse and leave the sensor area did not indicate any visible motion of the trucks that would affect the performance of the WIM scales. Trucks appear to track down the wheel path and daylight cannot be seen between the tires of any of the sensors for the equipment. There is discernable bouncing by trucks at the point of the asphalt to concrete transition 313 feet prior to the WIM scale area. These dynamics appear to diminish before the trucks enter the scale area.

5 Equipment Discussion

The traffic monitoring equipment at this location includes bending plate sensors and an iSINC controller. These sensors are installed in a portland cement concrete pavement about 424 ft in length. The roadway outside this short section is asphalt.

5.1 Pre-Evaluation Diagnostics

A complete electronic and electrical check of all system components including in-road sensors, electrical power, and telephone service were performed immediately prior to the evaluation. The loops sensor input leads were not shielded or grounded although they appeared to be working properly prior to beginning test truck runs. All sensors and system components were found to be within operating parameters.

5.2 Calibration Process

The equipment required no iterations of the calibration process between the initial 40 runs and the final 40 runs.

5.3 Summary of Traffic Sheet 16s

This site has validation information from the current visit only in the tables below. Table 5-1 has the information that should be found in TRF_CALIBRATION_AVC for Sheet 16s submitted for this validation.

Table 5-1 Classification Validation History – 510100 – 31-Jan-2007

Date	Method	Mean Difference				Percent Unclassified
		Class 9	Class 8	Other 1	Other 2	
30-Jan-07	Manual	0	0			0.0

Table 5-2 has the information that will be found in TRF_CALIBRATION_WIM for Sheet 16s submitted for this validation.

Table 5-2 Weight Validation History – 510100 – 31-Jan-2007

Date	Method	Mean Error and (SD)		
		GVW	Single Axles	Tandem Axles
31-Jan-07	Test Trucks	-0.8 (2.7)	-4.7 (2.6)	-0.1 (3.6)
30-Jan-07	Test Trucks	0.7 (2.7)	-2.6 (3.2)	1.3 (3.5)

5.4 Projected Maintenance/Replacement Requirements

Semi-annual preventive maintenance is to be performed at this site under provisions of the Phase II contract.

Currently, the loop lead-ins need to be replaced with shielded two-conductor cable from the pull boxes to prevent cross-talk and errant and false vehicle reports. This is needed to correct a problem in the adjacent lane.

No other corrective maintenance actions required at this site at this time.

6 Pre-Validation Analysis

This pre-validation analysis is based on test runs conducted January 30, 2007 during the early morning to mid afternoon hours at 510100 located approximately 8 miles north of Danville. This SPS-1 site is at milepost 12.8 on the US-29 Bypass in the southbound, righthand lane of a four-lane divided facility. No auto-calibration was used during test runs. The two trucks used for initial validation included:

1. 5-axle tractor semi-trailer combination with a tractor having an air suspension and trailer with standard rear tandem and an air suspension loaded to 75,710 lbs., the “golden” truck.
2. 5-axle tractor semi-trailer with a tractor having air suspension and a trailer with standard rear tandem and tapered leaf/walking beam suspension loaded to 65,210 lbs., the “partial” truck.

For the initial validation each truck made a total of 21 passes over the WIM scale at speeds ranging from approximately 42 to 64 miles per hour. The desired speed range was achieved during this validation. Pavement surface temperatures were recorded during the test runs ranging from about 28 to 50 degrees Fahrenheit. The desired 30 degree Fahrenheit temperature range was not achieved. The computed values of 95% confidence limits of each statistic for the total population are in Table 6-1.

As shown in Table 6-1, this site meets all LTPP precision requirements except speed which is not considered sufficient to disqualify the site as having research quality data.

Table 6-1 Pre-Validation Results – 510100 – 30-Jan-2007

SPS-1, -2, -5, -6 and -8	95 %Confidence Limit of Error	Site Values	Pass/Fail
Steering axles	±20 percent	-2.6 ± 6.4%	Pass
Tandem axles	±15 percent	1.3 ± 6.9%	Pass
GVW	±10 percent	0.7 ± 5.4%	Pass
Speed	±1 mph [2 km/hr]	**0.1 ± 1.4 mph**	**Fail**
Axle spacing	± 0.5 ft [150mm]	0.0 ± 0.0 ft	Pass

The test runs were conducted primarily during the afternoon hours of January 31st and the morning hours of February 1, 2007. Temperatures over the course of the test period did not fluctuate by a considerable amount, resulting in a narrow range of pavement temperatures. The runs were also conducted at various speeds to determine the effects of these variables on the performance of the WIM scale. To investigate these effects, the dataset was split into three speed groups and two temperature groups. The distribution of runs within these groupings is illustrated in Figure 6-1. The figure indicates that the desired distribution of speed and temperature combinations was not achieved for this set of validation runs.

The three speed groups were divided into 42 to 48 mph for Low speed, 49 to 57 mph for Medium speed and 58+ mph for High speed. The two temperature groups were created by splitting the runs between those at 28 to 40 degrees Fahrenheit for Low temperature, and 41 to 50 degrees Fahrenheit for High temperature. It can be seed from the figure that medium and high speed runs at the low end of the temperature range were not obtained.

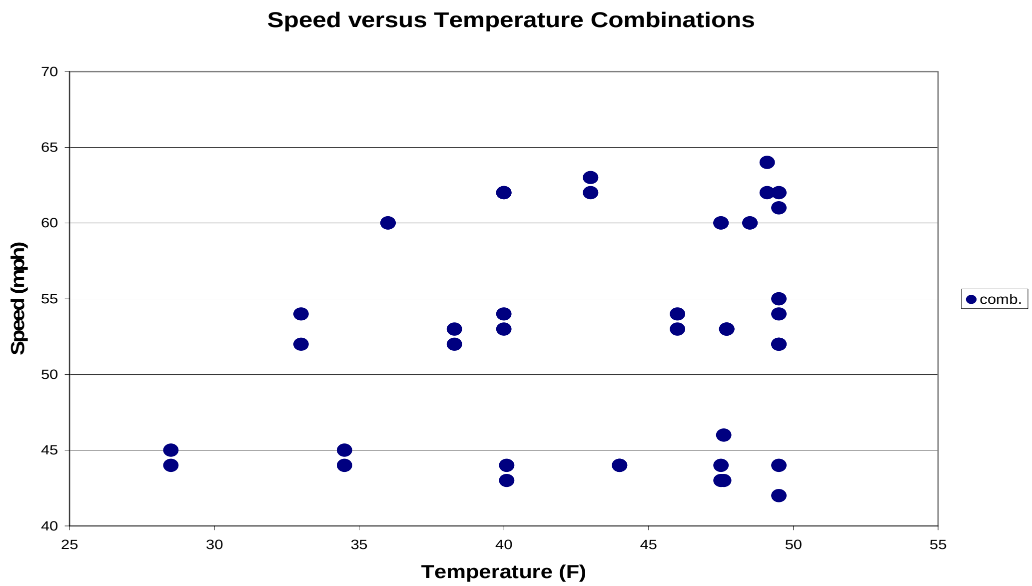

Figure 6-1 Pre-Validation Speed-Temperature Distribution – 510100 – 30-Jan-2007

A series of graphs was developed to investigate visually for any sign of any relationship between speed or temperature and the scale performance.

Figure 6-2 shows the GVW Percent Error vs. Speed graph for the population as a whole. The figure illustrates the tendency for the equipment to overestimate GVW at low and high speeds and underestimate GVW at medium speeds. Variability in error appears to greater at medium speeds when compared with low and high speeds.

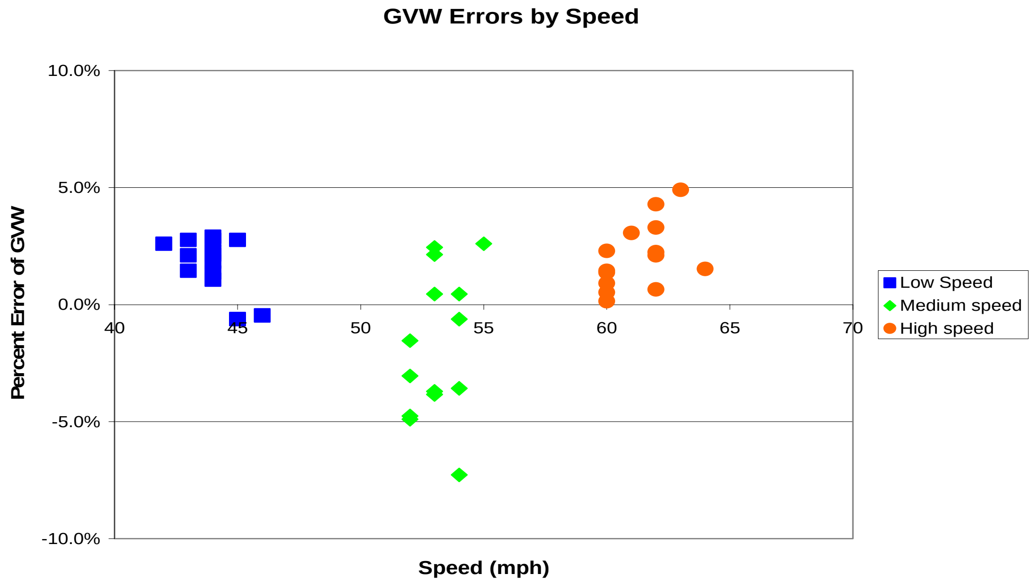

Figure 6-2 Pre-validation GVW Percent Error vs. Speed – 510100 – 30-Jan-2007

Figure 6-3 shows the relationship between temperature and GVW percentage error. It appears that the equipment estimates GVW reasonably well at all temperatures. Variability in GVW error appears to be fairly consistent over the entire temperature range, with a slight decrease at the high end of the temperature range due to one outlier.

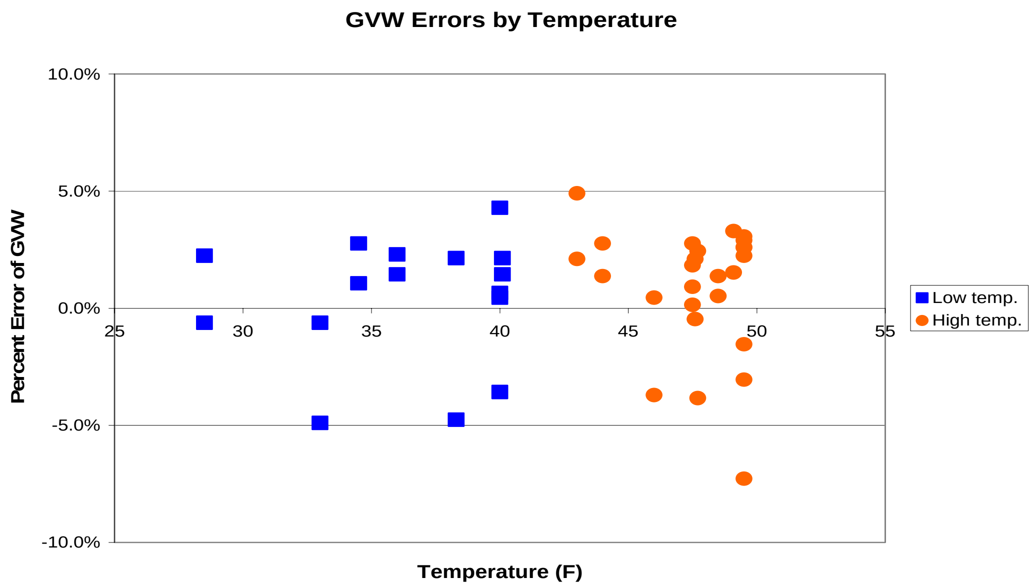

Figure 6-3 Pre-Validation GVW Percent Error vs. Temperature – 510100 – 30-Jan-2007

Figure 6-4 shows the relationship between the drive tandem spacing errors in feet and speeds. This graph is used as a potential indicator of classification errors due to failure to correctly identify spacings on a vehicle. Since the most common reference value is the drive tandem on a Class 9 vehicle, this is the spacing evaluated and plotted for validations. The graph indicates that the errors in tandem spacings for the test trucks were not affected by changes in speed.

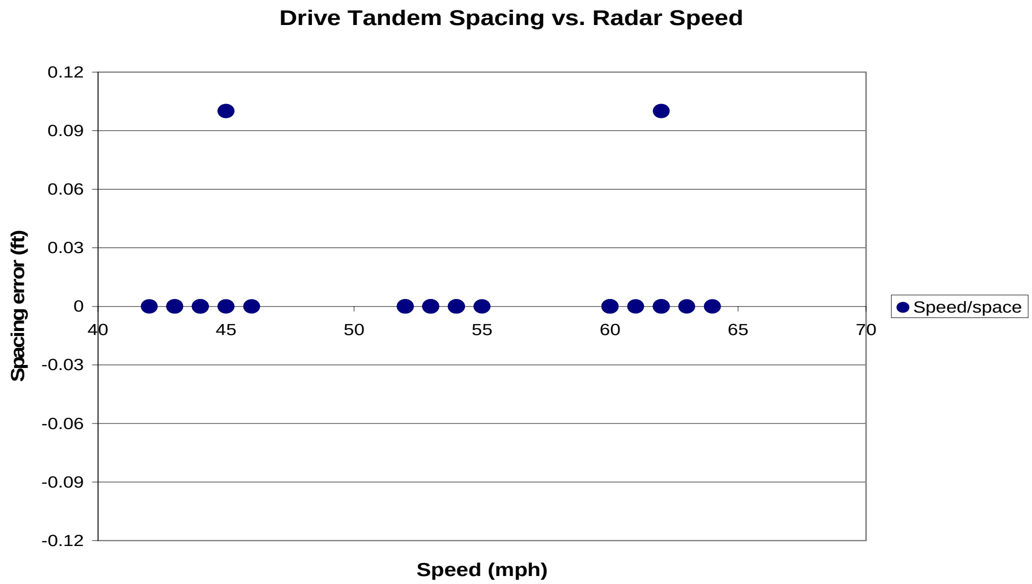

Figure 6-4 Pre-Validation Spacing vs. Speed - 510100 – 30-Jan-2007

6.1 Temperature-based Analysis

The two temperature groups were created by splitting the runs between those at 28 to 40 degrees Fahrenheit for Low temperature, and 41 to 50 degrees Fahrenheit for High temperature.

Table 6-2 Pre-Validation Results by Temperature Bin – 510100 – 30-Jan-2007

Element	95% Limit	Low Temperature 28 to 40 °F	High Temperature 41 to 50 °F
Steering axles	±20 %	-1.8 ± 5.9%	-3.1 ± 6.9%
Tandem axles	±15 %	0.9 ± 6.9%	1.6 ± 7.2%
GVW	±10 %	0.4 ± 5.7%	0.8 ± 5.6%
Speed	±1 mph	0.2 ± 1.2 mph	0.0 ± 1.6 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft

From Table 6-2, it appears that the equipment underestimates steering axle weights at all temperatures, and slightly overestimates tandem axle weights and GVW at all temperatures. The variability in error appears to remain fairly consistent over the entire temperature range for all weights.

Figure 6-5 shows the distribution of GVW Errors versus Temperature by Truck.

The equipment appears to estimate GVW reasonably well for the population as a whole. Individually, GVW for the "partial" truck (diamonds) is overestimated while GVW for the "golden" truck (squares) is estimated with reasonable accuracy. Variability in error for the golden truck appears to be greater than GVW error for the partial truck at all temperatures.

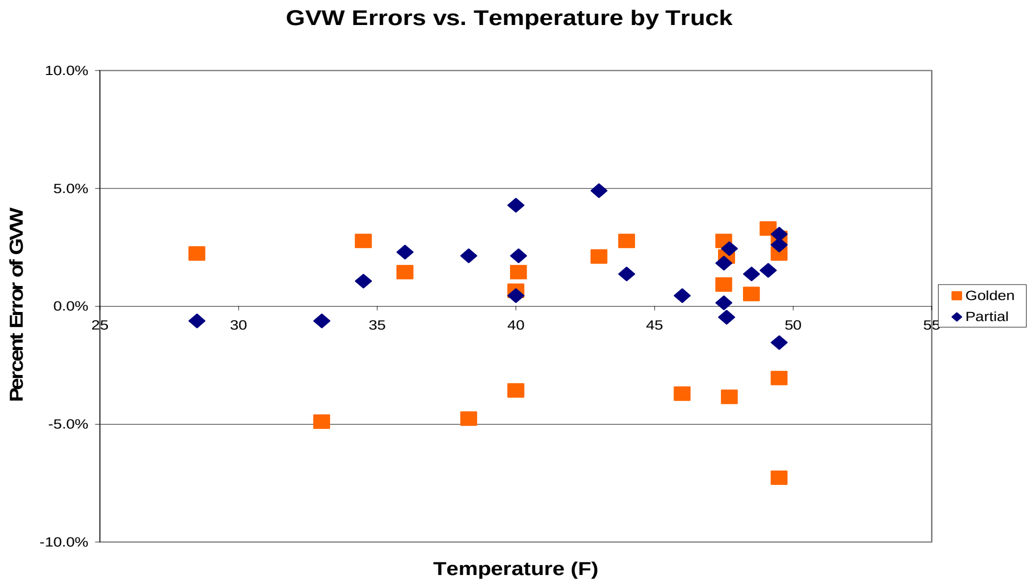

Figure 6-5 Pre-Validation GVW Percent Error vs. Temperature by Truck – 510100 – 30-Jan-2007

Figure 6-6 shows the relation between steering axle errors and temperature. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for auto-calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles. The figure shows that steering axle weights are consistently underestimated by the equipment over the entire temperature range. Variability in error appears to be greater at the limits of the temperature range when compared to the median temperatures. This may be the result of the limited sample size at these temperatures. Post-validation runs were specifically performed at these temperatures to further investigate this trend.

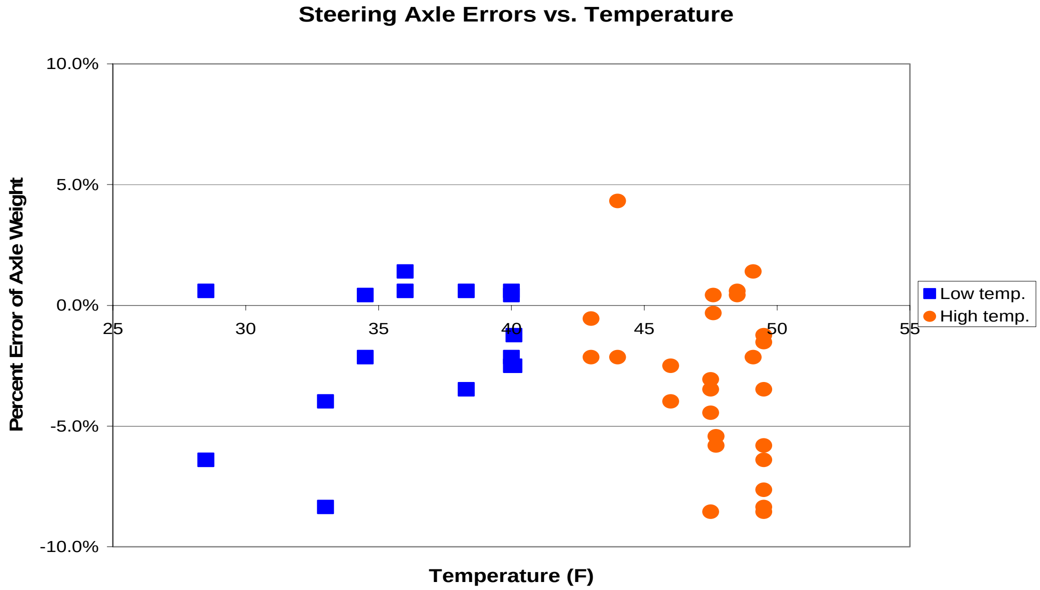

Figure 6-6 Pre-Validation Steering Axle Error vs. Temperature by Group – 510100 – 30-Jan-2007

6.2 Speed-based Analysis

The speed groups were divided as follows: Low speed – 42 to 48 mph, Medium speed – 49 to 57 mph and High speed – 58+ mph.

Table 6-3 Pre-Validation Results by Speed Bin – 510100 – 30-Jan-2007

Element	95% Limit	Low Speed 42 to 48 mph	Medium Speed 49 to 57 mph	High Speed 58+ mph
Steering axles	±20 %	-2.6 ± 8.1%	-4.4 ± 5.9%	-0.8 ± 3.9%
Tandem axles	±15 %	2.6 ± 4.7%	-1.2 ± 8.4%	2.5 ± 4.9%
GVW	±10 %	1.8 ± 2.5%	-1.8 ± 6.7%	2.1 ± 3.1%
Speed	±1 mph	0.4 ± 1.4 mph	-0.1 ± 1.3 mph	-0.1 ± 1.6 mph
Axle spacing	± 0.5 ft	0.0 ± 0.1 ft	0.0 ± 0.0 ft	0.0 ± 0.1 ft

From Table 6-3, it can be seen that the equipment underestimates steering axle weights at all speeds, and GVW and tandem weights at medium speeds. GVW and tandem weights are overestimated at low and high speeds. Variability in steering axle error appears to decrease as speed increases while the error spread for GVW and tandem weights is higher at medium speeds when compared to low and high speeds.

Figure 6-7 illustrates the tendency of the equipment to overestimate GVW at low and high speeds, and underestimate GVW at medium speeds for the population as a whole. For the “partial” truck (diamonds) GVW is estimated fairly consistent over the entire speed range, with a slight overestimation at the higher speeds. Variability for each truck individually is reasonably consistent over the entire speed range, however, the increased variability and the underestimation by the equipment for the population as a whole at the medium speeds is driven by the considerably greater underestimation of GVW for the "golden" truck (squares) at these speeds.

Speed studies performed from the post-visit data download indicate that the 15th percentile for speed at this site is 58 mph, which indicates that the majority of trucks at this site are not affected by this trend. The 85th percentile speed at this site is 67 mph, which exceeds the speed limit and the capabilities of these tests. The graph indicates that GVW for trucks traveling at and above this speed may be overestimated similarly to those at the higher test speeds.

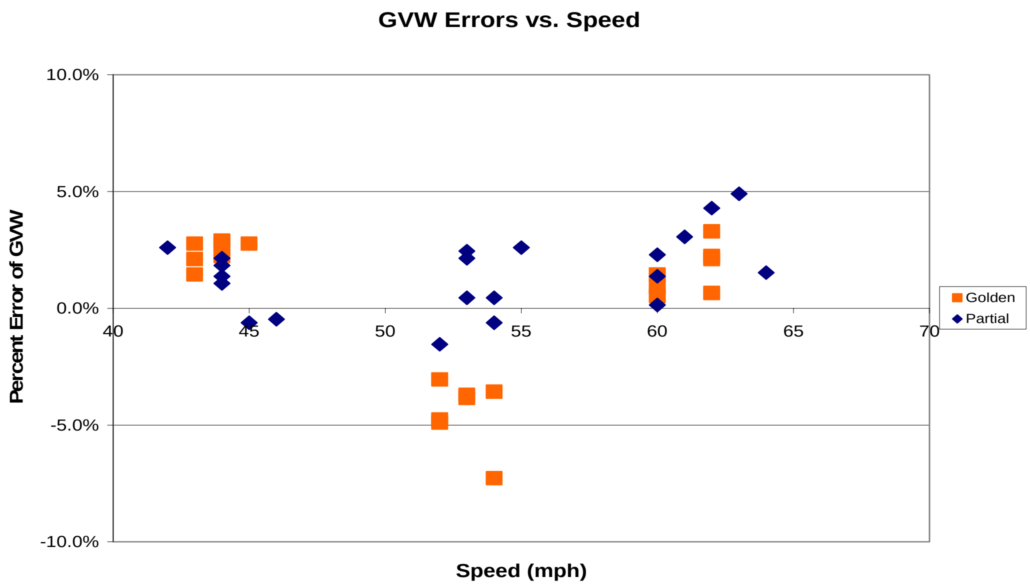

Figure 6-7 Pre-Validation GVW Percent Error vs. Speed Group - 510100 –30-Jan-2007

Figure 6-8 shows the relation between steering axle errors and speed. This graph is included due to the frequent use of steering axle weights of Class 9 vehicles for calibration. This site does not use auto-calibration. The steering axles in this graph are associated only with Class 9 vehicles.

From the figure, it appears that the equipment underestimates steering axle weights at all speeds. The underestimation appears to be greater at the low and medium speeds when compared with the higher speeds. Variability in error appears to also be greater at the low and medium speeds.

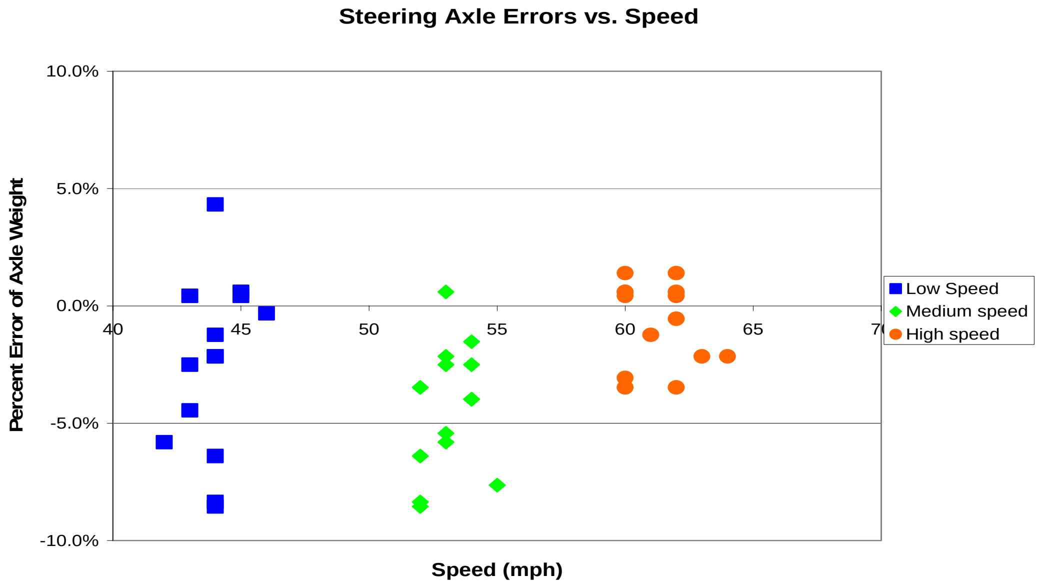

Figure 6-8 Pre-Validation Steering Axle Percent Error vs. Speed Group - 510100 – 30-Jan-2007

6.3 Classification Validation

This LTPP installed site uses the FHWA 13-bin classification scheme and the LTPP ETG mod 3 classification algorithm. Classification 15 has been added to account for unclassified vehicles.

The classification validation is intended to find gross errors in vehicle classification, not to validate the installed algorithm. A sample of 100 trucks was collected at the site. The classification identification is to identify gross errors in classification, not validate the classification algorithm. Video was taken at the site to provide ground truth for the evaluation. Based on a 100 percent sample it was determined that there are 0 percent unknown vehicles and 0 percent unclassified vehicles.

The second check is the ability of the algorithm to correctly distinguish between truck classes with no more than 2% errors in such classifications. Table 6-4 has the classification error rates by class. The overall misclassification rate is 0 percent.

Table 6-4 Truck Misclassification Percentages for 510100 – 30-Jan-2007

Class	Percent Error	Class	Percent Error	Class	Percent Error
4	N/A	5	0	6	0
7	N/A				
8	0	9	0	10	N/A
11	0	12	N/A	13	N/A

The misclassification percentage is computed as the probability that a pair containing the class of interest does NOT include a match. Thus if there are eight pairs of observations with at least one Class 9 and only six of them are matches, the error rate is 25 percent. The percent error and the mean differences reported below do not represent the same statistic. It is possible to have error rates greater than 0 with a mean difference of zero.

Table 6-5 Truck Classification Mean Differences for 510100 – 30-Jan-2007

Class	Mean Difference	Class	Mean Difference	Class	Mean Difference
4	N/A	5	0	6	0
7	N/A				
8	0	9	0	10	N/A
11	0	12	N/A	13	N/A

These error rates are normalized to represent how many vehicles of the class are expected to be over- or under-counted for every hundred of that class observed by the equipment. Thus a value of 0 means the class is identified correctly on average. A number between –1 and –100 indicates at least that number of vehicles either missed or not assigned to the class by the equipment. It is not possible to miss more than all of them or one hundred out of one hundred. Numbers 1 or larger indicate at least how many more vehicles are assigned to the class than the actual “hundred observed”. Classes marked Unknown are those identified by the equipment but no vehicles of the type were seen the observer. There is no way to tell how many vehicles of that type might actually exist. N/A means no vehicles of the class were recorded by either the equipment or the observer.

6.4 Evaluation by ASTM E-1318 Criteria

The ASTM E-1318 criteria for a successful validation of Type I sites is 95% of the observed errors within the limits for allowable errors for each of the relevant statistics. If this site had been evaluated using ASTM E-1318-02 it would have met the conditions for a Type I site exclusive of wheel loads. LTPP does not validate WIM performance with respect to wheel loads.

Table 6-6 Results of Validation Using ASTM E-1318-02 Criteria

Characteristic	Limits for Allowable Error	Percent within Allowable Error	Pass/Fail
Single Axles	± 20%	100%	Pass
Axle Groups	± 15%	100%	Pass
GVW	± 10%	100%	Pass

7 Data Availability and Quality

As of January 30, 2007 this site does not have at least 5 years of research quality data. Research quality data is defined to be at least 210 days in a year of data of known calibration meeting LTPP’s precision requirements.

Data that has validation information available has been reviewed in light of the patterns present in the two weeks immediately following a validation/calibration activity. A determination of research quality data is based on the consistency with the validation pattern. Data that follows consistent and rational patterns in the absence of calibration information may be considered nominally of research quality pending validation information with which to compare it. Data that is inconsistent with expected patterns and has no supporting validation information is not considered research quality.

This site is a new installation. The site was selected by IRD and is located approximately 500 feet downstream of the original site. Therefore, there is no data for this site. **An additional 5 years of data is needed to meet the goal of a minimum of 5 years of research weight data.**

The amount and coverage for the previous site is shown in Table 7-1. The value for months is a measure of the seasonal variation in the data. The indicator of coverage indicates whether day of week variation has been accounted for on an annual basis. As can be seen from the table only 1997 has a sufficient quantity to be considered a complete year of data. In the absence of previously gathered validation information it can be seen that at least 5 additional years of research quality data are needed to meet the goal of a minimum of 5 years of research weight data.

Table 7-1 Amount of Traffic Data Available 510100 – 30-Jan-2007

Year	Classification Days	Months	Coverage	Weight Days	Months	Coverage
1997	296	12	Full Week	286	11	Full Week
2004	7	1	Full Week			
2005	7	1	Full Week			

GVW graphs and characteristics associated with them are used as data screening tools. As a result classes constituting more that ten percent of the truck population are considered major sub-groups whose evaluation characteristics should be identified for use in screening. The typical values to be used for reviewing incoming data after a validation are determined starting with data from the day after the completion of a validation.

Class 9s and Class 5s constitute more than 10 percent of the truck population. Based on the data collected from the end of the validation the following are the expected values for these populations. The precise values to be used in data review will need to be determined by the RSC on receipt of the first 14 days of data after the successful validation. For sites that do not meet LTPP precision requirements, this period may still be used as a starting point from which to track scale changes.

Table 7-2 is generated with a column for every vehicle class 4 or higher that represents 10 percent or more of the truck (class 4-20) population. In creating Table 7-2 the following definitions are used:

- Class 9 overweights are defined as the percentage of vehicles greater than 88,000 pounds
- Class 9 underweights are defined as the percentage of vehicles less than 20,000 pounds.

- Class 9 unloaded peak is the bin less than 44,000 pounds with the greatest percentage of trucks.
- Class 9 loaded peak is the bin 60,000 pounds or larger with the greatest percentage of trucks.
- For all other trucks the typical axle configuration is used to determine the maximum allowable weight based on 18,000 pounds for single axles and 34,000 pounds for tandem axles. A ten percent cushion above that maximum is used to set the overweight threshold.
- For all other trucks in the absence of site specific information the computation of under weights assumes the power unit weighs 10,000 pounds and each axle on a trailer 5,000 pounds. Ninety percent of the total for the unloaded configuration is the value below which a truck is considered under weight.
- For all trucks other than class 9s that have a bi-modal distribution the unloaded peak is defined to be in a bin less than or equal to half of the allowable maximum weight.
- For all trucks other than class 9s that have a bi-modal distribution the loaded peak is defined to be in a bin greater than or equal to half of the allowable maximum weight.

There may be more than one bin identified for the unloaded or loaded peak due to the small sample size collected after validation. Where only one peak exists, the peak rather than a loaded or unloaded peak is identified. This may happen with single unit trucks. It is not expected to occur with combination vehicles.

Table 7-2 GVW Characteristics of Major sub-groups of Trucks – 510100 – 31-Jan-2007

Characteristic	**Class 9**	**Class 5**
Percentage Overweights	0.4%	0.5%
Percentage Underweights	0.0%	0.0%
Unloaded Peak	36,000 lbs	
Loaded Peak	84,000 lbs	
Peak		12,000 lbs

The expected percentage of unclassified vehicles is 2.0%. This is based on the percentage of unclassified vehicles in the post-validation data download.

The graphical screening comparison figures are found in Figure 7-1 through Figure 7-4. These are based on data collected immediately after the validation and may not be wholly representative of the population at the site. They should however provide a sense of the statistics expected when SPS comparison data is computed for the post-validation Sheet 16.

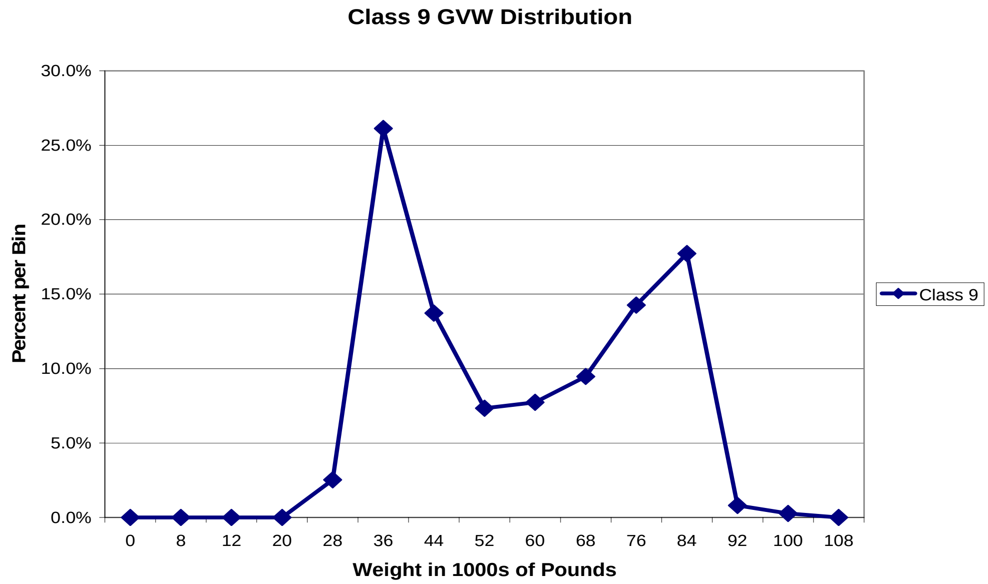

Figure 7-1 Expected GVW Distribution Class 9 – 510100 – 31-Jan-2007

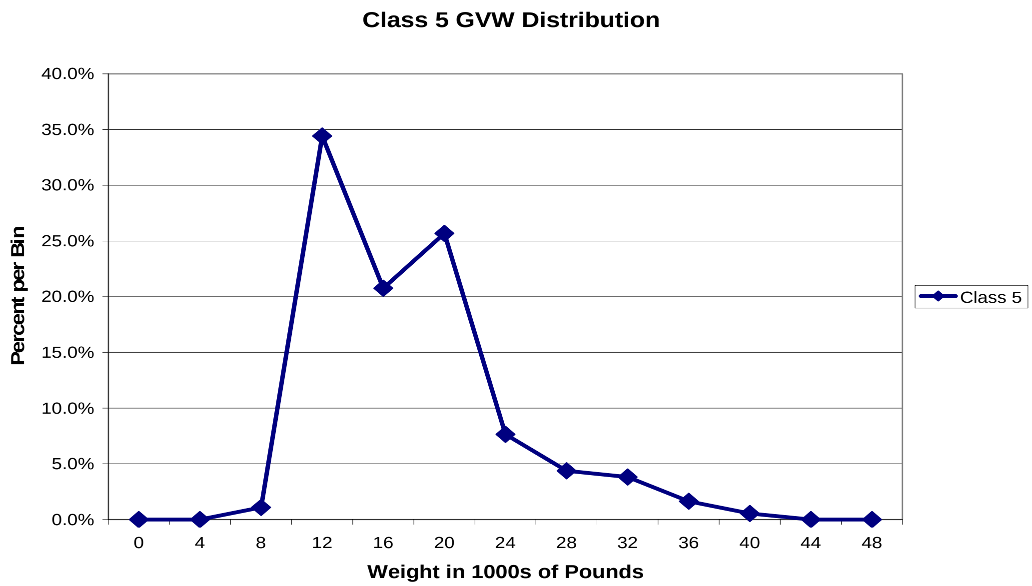

Figure 7-2 Expected GVW Distribution Class 5 – 510100 – 31-Jan-2007

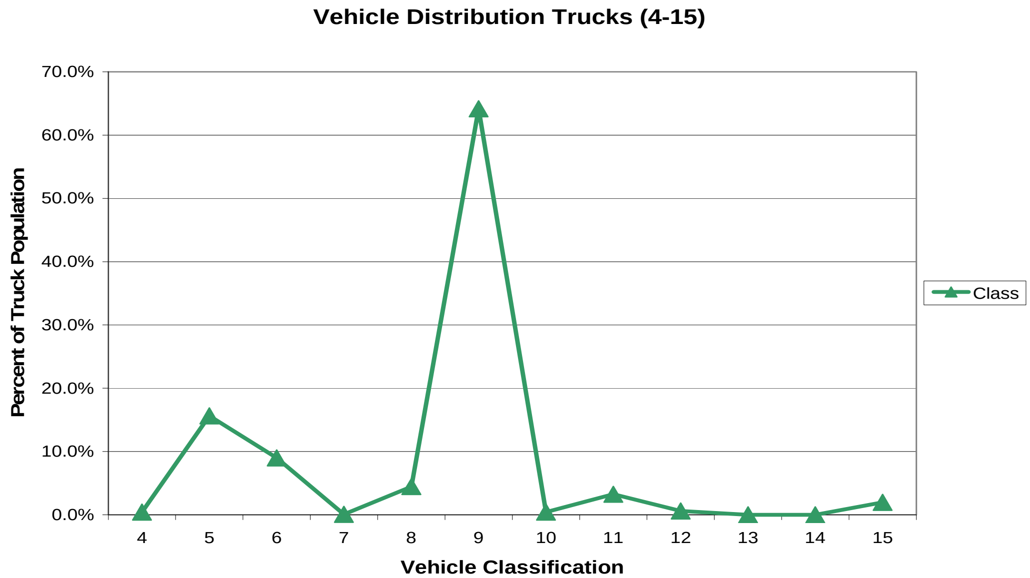

Figure 7-3 Expected Vehicle Distribution – 510100 – 31-Jan-2007

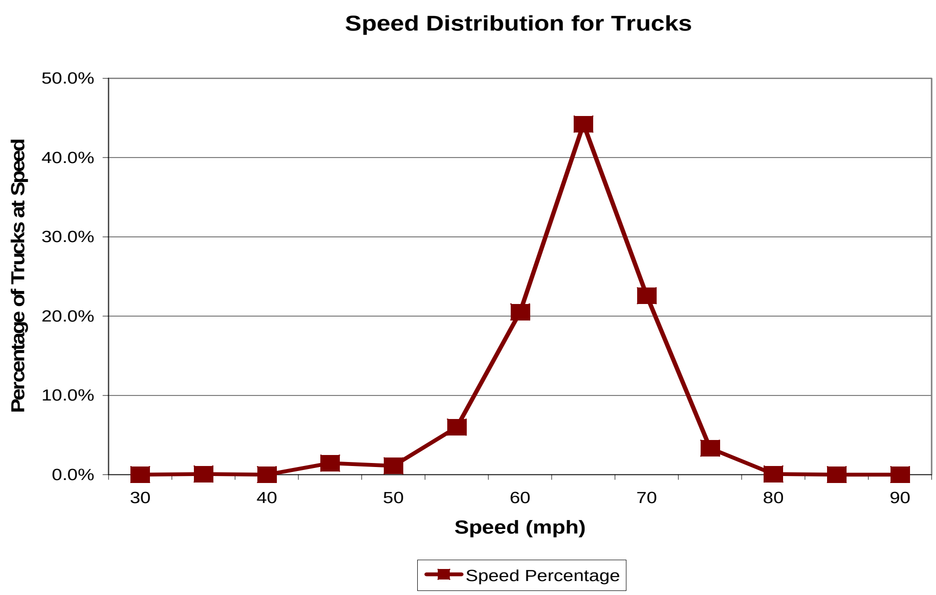

Figure 7-4 Expected Speed Distribution – 510100 – 31-Jan-2007

8 Data Sheets

The following is a listing of data sheets incorporated in Appendix A.

Sheet 19 – Truck 1 – 3S2 loaded air suspension (4 pages)
Sheet 19 – Truck 2 – 3S2 partially loaded air suspension tractor, tapered leaf/walking beam suspension trailer (4 pages)

Sheet 20 – Speed and Classification verification Pre-Validation (2 pages)

Sheet 21 – Pre-Validation (3 pages)
Sheet 21 – Post-Validation (3 pages)

Sheet 22 – Site Equipment Assessment (8 pages)

Sheet 23 – WIM System Troubleshooting Outline (5 pages)

System Parameters (1 page)

Installed Class Scheme (1 page)

Truck Photographs (7 pages)

9 Updated Handout Guide and Sheet 17

A copy of the handout has been included following this page. It includes a current Sheet 17 with all applicable maps and photographs. There are no significant changes in the information provided.

10 Updated Sheet 18

A current Sheet 18 indicating the contacts, conditions for assessments and evaluations has been attached following the updated handout guide.

11 Traffic Sheet 16(s)

Sheet 16s for the pre-validation and post-validation conditions are attached following the current Sheet 18 information at the very end of the report.

POST-VISIT HANDOUT GUIDE FOR SPS WIM FIELD VALIDATION

STATE: Virginia

SHRP ID: 510100

Figures

1. General Information

SITE ID: *510100*

LOCATION: *US-29 Bypass, milepost 12.8, near Danville*

VISIT DATE: *January 30, 2007*

VISIT TYPE: *Validation*

2. Contact Information

POINTS OF CONTACT:

Validation Team Leader: *Dean J. Wolf, 301-210-5105, djwolf@mactec.com*

Highway Agency: *Mohamed Elfino, 804-328-3173,*
Mohamed.elfino@vdot.virginia.gov

Richard Bush, 804-786-7006,
Richard.bush@vdot.virginia.gov

Hamlin Williams, 804-786-0134,
Hamlin.williams@vdot.virginia.gov

FHWA COTR: *Debbie Walker, 202-493-3068, deborah.walker@fhwa.dot.gov*

FHWA Division Office Liaison: *Lorenzo Casanova, 804-775-3362,*
Lorenzo.casanove@fhwa.dot.gov

LTPP SPS WIM WEB PAGE: *http://www.tfhrc.gov/pavement/ltpp/spstraffic/index.htm*

3. Agenda

BRIEFING DATE: *No briefing requested for this visit.*

ON SITE PERIOD: *January 30 through February 1, 2007.*

TRUCK ROUTE CHECK: *Completed at Calibration.*

4. Site Location/ Directions

NEAREST AIRPORT: *Piedmont Triad International Airport, Greensboro, NC*

DIRECTIONS TO THE SITE: *US-29 Bypass, approximately 8 miles north of Danville.*

MEETING LOCATION: *On site beginning at 9:00 a.m.*

WIM SITE LOCATION: *US-29 bypass, milepost 12.8; GPS = 36.6599° N, -79.3656° W.*

WIM SITE LOCATION MAP: *See Figure 4.1*

Figure 4-1 – Site 510100 in Virginia

5. Truck Route Information

ROUTE RESTRICTIONS: *None*

SCALE LOCATION: *9181 US-29, Blairs, VA; approximately 4 miles north of the site; GPS = 36.7163° N, -79.3793° W.*

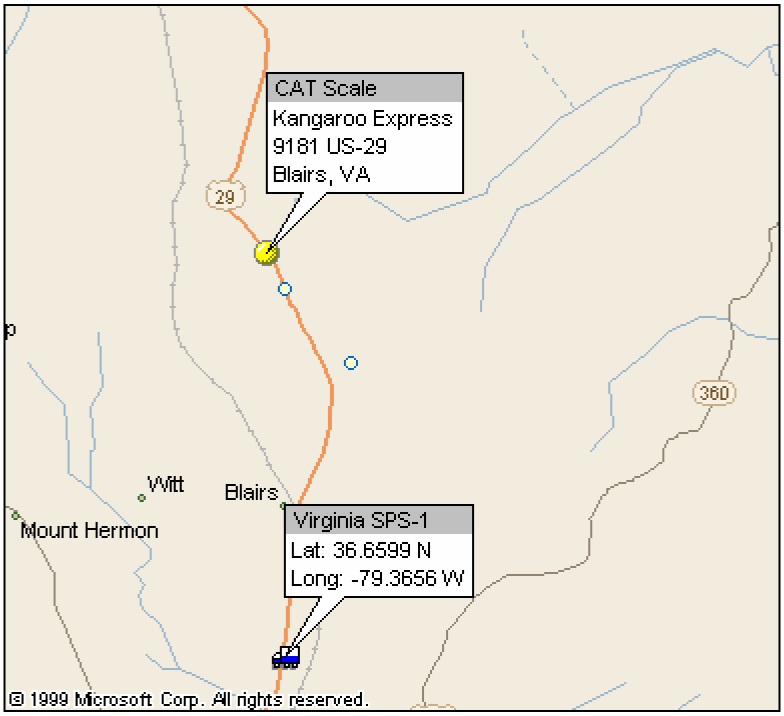

Figure 5-1 – Truck Scale Location for 510100 in Virginia

TRUCK ROUTE: *See Figure 5.1*

NB on US-29 to Blairs/Danville exit (2.7 miles)
SB on US-29 to Halifax exit (3.1 miles)

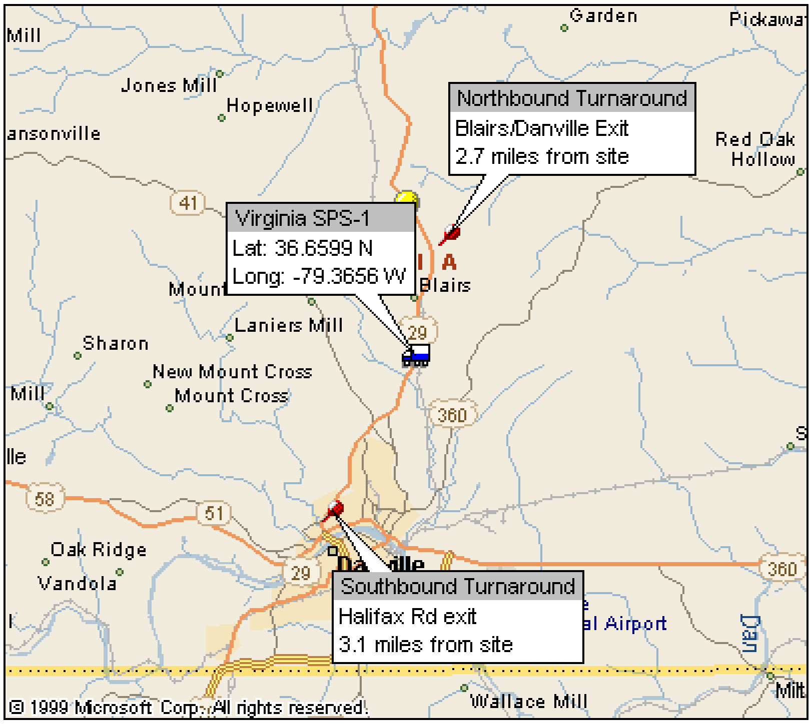

Figure 5-2 – Truck Route at 510100 in Virginia

SB distance = 3.1 miles
NB distance = 2.7 miles

Total distance = 11.6 miles (14 minutes)

6. Sheet 17 – Virginia (510100)

1.* ROUTE _US-29 Bypass__ MILEPOST __12.8__ LTPP DIRECTION - N <u>S</u> E W

2.* WIM SITE DESCRIPTION - Grade _< 1____ % Sag vertical Y / <u>N</u>
Nearest SPS section upstream of the site _5_1_0_1_4__
Distance from sensor to nearest downstream SPS Section ___ _3_9_5___ ft

3.* LANE CONFIGURATION
Lanes in LTPP direction __2_ Lane width _1_2_ ft

Median - 1 – painted
2 – physical barrier
<u>3 – grass</u>
4 – none

Shoulder - 1 – curb and gutter
<u>2 – paved AC</u>
3 – paved PCC
4 – unpaved
5 – none

Shoulder width __1_1__ ft

4.* PAVEMENT TYPE ___PCC___________________

5.* PAVEMENT SURFACE CONDITION – Distress Survey
Date: 01/30/07
Filename: 6420060018_SPSWIM_TO_16_51_2.75_0100_Upstream_01_30_07.jpg
Date: 01/30/07
Filename: 6420060018_SPSWIM_TO_16_51_2.75_0100_Downstream_01_30_07.jpg

6. * SENSOR SEQUENCE _______Loop – Bending Plate – Bending Plate – Loop___

7. * REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __
REPLACEMENT AND/OR GRINDING __ __ __ / __ __ / __ __ __ __

8. RAMPS OR INTERSECTIONS
Intersection/driveway within 300 m upstream of sensor location Y / <u>N</u>
distance ______
Intersection/driveway within 300 m downstream of sensor location Y / <u>N</u>
distance ____
Is shoulder routinely used for turns or passing? Y / <u>N</u>

9. DRAINAGE (*Bending plate and load cell systems only)*
<u>1 – Open to ground</u>
2 – Pipe to culvert
3 – None

Clearance under plate ___ __ 4 . 0 __ in
Clearance/access to flush fines from under system Y / <u>N</u>

10. * CABINET LOCATION

Same side of road as LTPP lane Y / N   Median Y/ N   Behind barrier Y / N
Distance from edge of traveled lane _2_7__ ft
Distance from system __4_1__ ft
TYPE ____336 Short_______________

CABINET ACCESS controlled by LTPP / STATE / JOINT ?
Contact - name and phone number _Hamlin Williams__804-786-7006___
Alternate - name and phone number __Roy Czinku__306-653-6627___

11. * POWER

Distance to cabinet from drop __ _4 __ __ ft   Overhead / underground / solar /
AC in cabinet?
Service provider _________________ Phone number __________________

12. * TELEPHONE

Distance to cabinet from drop __ _4 __ __ ft   Overhead / under ground / cell?
Service provider ______________ Phone Number ________________

13.* SYSTEM (software & version no.)- ___IRD iSINC_______________________
Computer connection – RS232 / Parallel port / USB / Other ______________

14. * TEST TRUCK TURNAROUND time __14 minutes__Distance _11.6__ mi.

15. PHOTOS   FILENAME

(6420060018_SPSWIM_TO_16_51_2.75_0100_)

Power source ______Power_Meter_01_30_07.jpg _________________________
Phone source ______Telephone_Box_01_30_07.jpg _______________________
Cabinet exterior ______Cabinet_Exterior_01_30_07.jpg ______________________
Cabinet interior ______Cabinet_Interior_Front_01_30_07.jpg _________________
______Cabinet_Interior_Rear_01_30_07.jpg _________________
Weight sensors ______Leading_WIM_Sensor_01_30_07.jpg _________________
______Trailing_WIM_Sensor_01_30_07.jpg __________________
Other sensors ______Leading_Loop_01_30_07.jpg ________________________
______Trailing_Loop_01_30_07.jpg ________________________
Description __Loop Sensors___________________________________
Downstream direction at sensors on LTPP lane: ____ Downstream_01_30_07.jpg ___
Upstream direction at sensors on LTPP lane: ____Upstream_01_30_07.jpg ______

COMMENTS ____

_____ concrete section = 425 feet ____

_____ leading edge of leading loop is 313 feet from approaching transition ___________

COMPLETED BY ____Dean J. Wolf_________________

PHONE _301-210-5105______ DATE COMPLETED _0_1_ /_3_0_ / _2_0_0_7__

Sketch of equipment layout

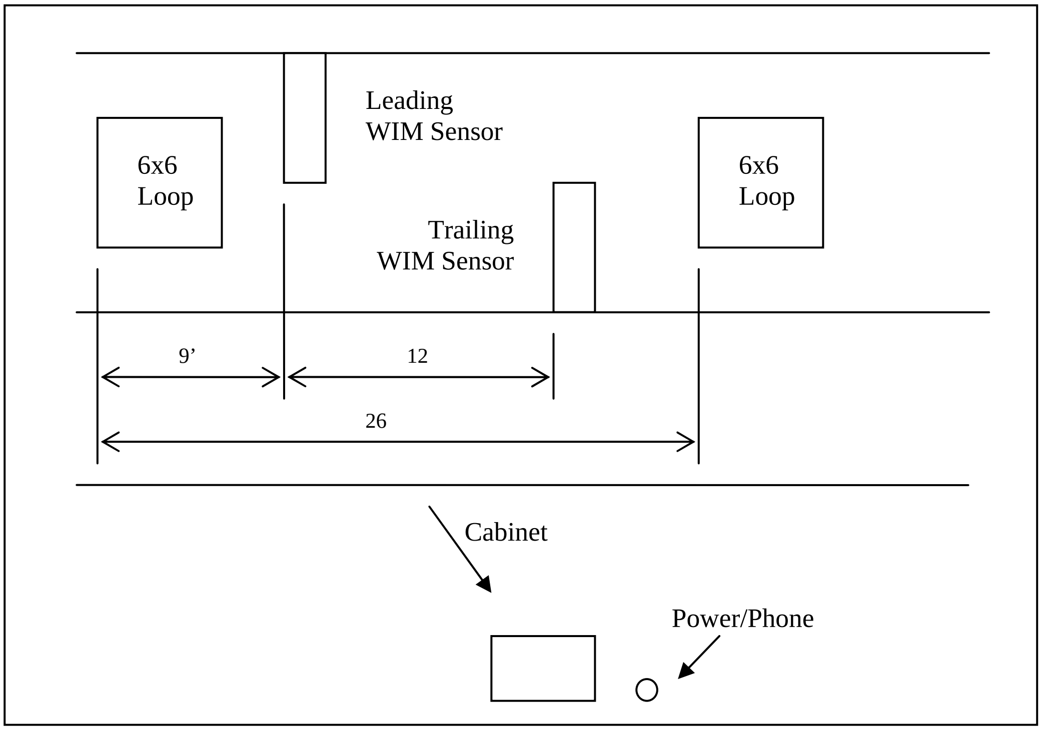

Figure 6-1 - Site Equipment Layout for 510100 in Virginia

Site Map

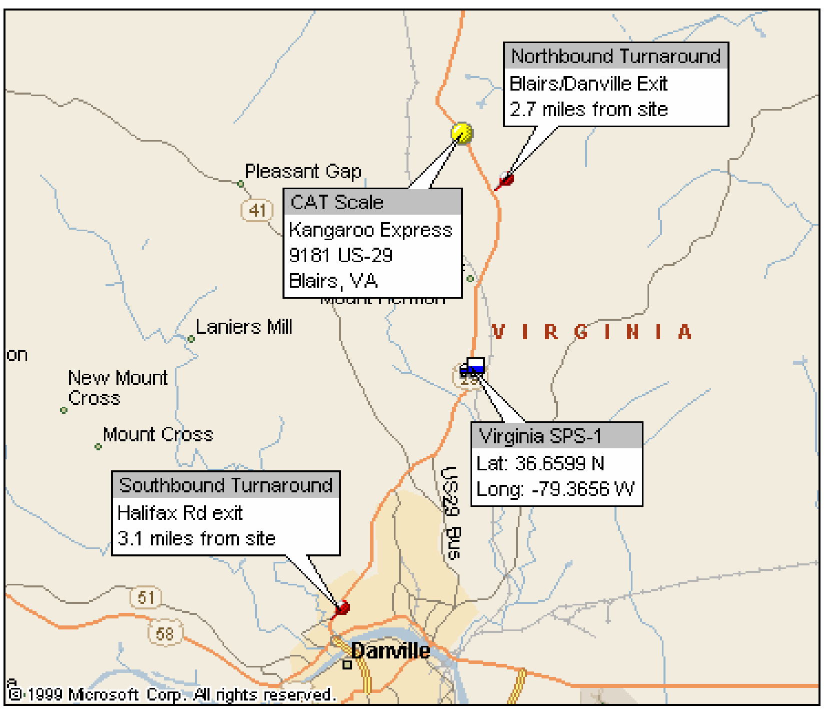

Figure 6-2 - Site Map for 510100 in Virginia

Figure 6-3 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Downstream _01_30_07.jpg

Figure 6-4 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Upstream_01_30_07.jpg

Figure 6-5 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Transition_01_30_07.jpg

Figure 6-6 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Cabinet_Interior_Front _01_30_07.jpg

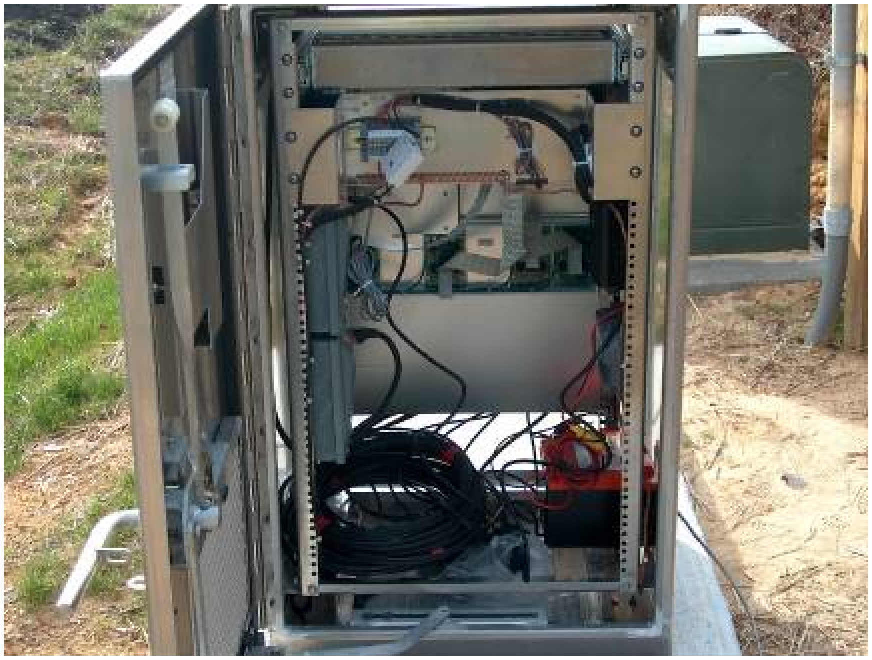

Figure 6-7 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Cabinet_Interior_Rear _01_30_07.jpg

Figure 6-8 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Cabinet_Exterior _01_30_07.jpg

Figure 6-9 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Power_Meter _01_30_07.jpg

Figure 6-10 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Telephone_Box _01_30_07.jpg

Figure 6-11 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Service_Mast _01_30_07.jpg

Figure 6-12 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Leading_Loop _01_30_07.jpg

Figure 6-13 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Leading_WIM_Sensor _01_30_07.jpg

Figure 6-14 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Trailing_WIM_Sensor _01_30_07.jpg

Figure 6-15 – 6420060018_SPSWIM_TO_16_51_2.75_0100_Trailing_Loop _01_30_07.jpg

SHEET 18	STATE CODE [_5_1_]
LTPP MONITORED TRAFFIC DATA	SPS PROJECT ID [_0_1_0_0]
WIM SITE COORDINATION	DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0 _0_7_

Rev. 05/25/04

1. DATA PROCESSING –
   a. Down load –
      - ☐ State only
      - ☐ LTPP read only
      - X LTPP download
      - ☐ LTPP download and copy to state

   b. Data Review –
      - ☐ State per LTPP guidelines
      - ☐ State – ☐ Weekly ☐ Twice a Month ☐ Monthly ☐ Quarterly
      - X LTPP

   c. Data submission –
      - ☐ State – ☐ Weekly ☐ Twice a month ☐ Monthly ☐ Quarterly
      - X LTPP

2. EQUIPMENT –
   a. Purchase –
      - ☐ State
      - X LTPP

   b. Installation –
      - ☐ Included with purchase
      - ☐ Separate contract by State
      - ☐ State personnel
      - X LTPP contract

   c. Maintenance –
      - X Contract with purchase – Expiration Date _8/2011_
      - ☐ Separate contract LTPP – Expiration Date ________
      - ☐ Separate contract State – Expiration Date ________
      - ☐ State personnel

   d. Calibration –
      - ☐ Vendor
      - ☐ State
      - X LTPP

   e. Manuals and software control –
      - X State
      - ☐ LTPP

   f. Power –
      i. Type –
         - ☐ Overhead
         - X Underground
         - ☐ Solar

      ii. Payment –
         - X State
         - ☐ LTPP
         - ☐ N/A

g. Communication –
   i. Type –
      X Landline
      □ Cellular
      □ Other
   ii. Payment –
      X State
      □ LTPP
      □ N/A

3. PAVEMENT –
   a. Type –
      X Portland Concrete Cement
      □ Asphalt Concrete

   b. Allowable rehabilitation activities –
      □ Always new
      □ Replacement as needed
      □ Grinding and maintenance as needed
      X Maintenance only
      □ No remediation

   c. Profiling Site Markings –
      □ Permanent
      X Temporary

4. ON SITE ACTIVITIES –
   a. WIM Validation Check - advance notice required ___2___ □ days X weeks

   b. Notice for straightedge and grinding check - ___1___ □ days X weeks
      i. On site lead –
         X State
         □ LTPP

      ii. Accept grinding –
         X State
         □ LTPP

   c. Authorization to calibrate site –
         X State only
         □ LTPP

   d. Calibration Routine –
         X LTPP – □ Semi-annually X Annually
         □ State per LTPP protocol – □ Semi-annually □ Annually
         □ State other – ___________________________

e. Test Vehicles
   i. Trucks –
      1st – Air suspension 3S2 ☐ State X LTPP
      2nd – ___3S2 _________ ☐ State X LTPP
      3rd – ________________ ☐ State ☐ LTPP
      4th – ________________ ☐ State ☐ LTPP
   ii. Loads – ☐ State X LTPP
   iii. Drivers – ☐ State X LTPP

f. Contractor(s) with prior successful experience in WIM calibration in state:

____

g. Access to cabinet
   i. Personnel Access –
      ☐ State only
      X Joint
      ☐ LTPP
   ii. Physical Access –
      X Key
      ☐ Combination

h. State personnel required on site – X Yes ☐ No

i. Traffic Control Required – ☐Yes X No

j. Enforcement Coordination Required – ☐Yes X No

5. SITE SPECIFIC CONDITIONS –
   a. Funds and accountability – ____
   b. Reports – ____
   c. Other – ____
   d. Special Conditions – ____

6. CONTACTS –
   a. Equipment (operational status, access, etc.) –

      Name: _Roy Czinku______________ Phone: _306-653-6627___________

      Agency: ____IRD/PAT Traffic________________________________

b. Maintenance (equipment) –

Name: _Roy Czinku_____________ Phone: _306-653-6627__________

Agency: ____IRD/PAT Traffic______________________________

c. Data Processing and Pre-Visit Data –

Name: _Roy Czinku_____________ Phone: _306-653-6627__________

Agency: ____IRD/PAT Traffic______________________________

d. Construction schedule and verification –

Name: ___Don French___________ Phone: _434-947-6559_____

Agency: __Lynchburg District, VA DOT_____________________

e. Test Vehicles (trucks, loads, drivers) –

Name: __Ed Foust_______________ Phone: __434-799-6743____

Agency: __Thompson Trucking, Inc.________________________

f. Traffic Control –

Name: ___Don French___________ Phone: _434-947-6559_____

Agency: __Lynchburg District, VA DOT_____________________

g. Enforcement Coordination –

Name: ________________________ Phone: _________________

Agency: ____

h. Nearest Static Scale

Name:__Kangaroo_________ Location: __I-29 Business, Blairs, VA_________

Phone: ____

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [_5_1_] *SHRP SECTION ID [_0_1_0_0_]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_1_ / _3_0_ / _2_0_0_7_]

2. * TYPE OF EQUIPMENT CALIBRATED __ WIM __ CLASSIFIER _x_ BOTH

3. * REASON FOR CALIBRATION
____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
____ EQUIPMENT REPLACEMENT ____ TRAINING
____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
_x__ OTHER (SPECIFY) ___LTPP Validation ____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
____ BARE ROUND PIEZO CERAMIC ____ BARE FLAT PIEZO __x_ BENDING PLATES
____ CHANNELIZED ROUND PIEZO ____ LOAD CELLS ____ QUARTZ PIEZO
____ CHANNELIZED FLAT PIEZO __x_ INDUCTANCE LOOPS ____ CAPACITANCE PADS
____ OTHER (SPECIFY) ____

5. EQUIPMENT MANUFACTURER ______IRD/PAT Traffic____

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
____ TRAFFIC STREAM -- ____STATIC SCALE (Y/N) __x_ TEST TRUCKS

__ __ __ NUMBER OF TRUCKS COMPARED __ _2 __ NUMBER OF TEST TRUCKS USED

__2_1__ PASSES PER TRUCK

TYPE PER FHWA 13 BIN SYSTEM
SUSPENSION: 1 - AIR; 2 - LEAF SPRING
3 - OTHER (DESCRIBE)

TRUCK	TYPE	SUSPENSION
1	___9____	__1________________
2	___9____	__2________________
3	________	___________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
MEAN DIFFERENCE BETWEEN ---
DYNAMIC AND STATIC GVW ___ ___ __0 . 7_ STANDARD DEVIATION __ _2 . 7_
DYNAMIC AND STATIC SINGLE AXLES ___ ___ _- 2 . 6_ STANDARD DEVIATION __ _3 . 2_
DYNAMIC AND STATIC DOUBLE AXLES ___ ___ __1 . 3_ STANDARD DEVIATION __ _3 . 5_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ______ _____45 , 55 , 65______ ______ ______ ______ ______
______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ __3_7_0_0___ ___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) __N__
IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: ________________________________
____
____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
___ VIDEO _x_ MANUAL ___ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT ____ TIME __x_ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ _0 . 0____ FHWA CLASS ____ ____ ____ ____ ____
*** FHWA CLASS 8 ____ _0 . 0____ FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ___ 0 . 0__

PERSON LEADING CALIBRATION EFFORT: _Dean J. Wolf, MACTEC Engineering ___________________________
CONTACT INFORMATION: ___301-210-5105____ rev. November 9, 1999

SHEET 16 LTPP MONITORED TRAFFIC DATA SITE CALIBRATION SUMMARY	*STATE ASSIGNED ID [__ __ __ __] *STATE CODE [_5_1_] *SHRP SECTION ID [_0_1_0_0_]

SITE CALIBRATION INFORMATION

1. * DATE OF CALIBRATION (MONTH/DAY/YEAR) [_0_2_ / _0_1_ / _2_0_0_7_]

2. * TYPE OF EQUIPMENT CALIBRATED __ WIM __ CLASSIFIER _x_ BOTH

3. * REASON FOR CALIBRATION
   ____ REGULARLY SCHEDULED SITE VISIT ____ RESEARCH
   ____ EQUIPMENT REPLACEMENT ____ TRAINING
   ____ DATA TRIGGERED SYSTEM REVISION ____ NEW EQUIPMENT INSTALLATION
   _x__ OTHER (SPECIFY) ___LTPP Validation ____

4. * SENSORS INSTALLED IN LTPP LANE AT THIS SITE (CHECK ALL THAT APPLY):
   ____ BARE ROUND PIEZO CERAMIC ____ BARE FLAT PIEZO __x_ BENDING PLATES
   ____ CHANNELIZED ROUND PIEZO ____ LOAD CELLS ____ QUARTZ PIEZO
   ____ CHANNELIZED FLAT PIEZO __x_ INDUCTANCE LOOPS ____ CAPACITANCE PADS
   ____ OTHER (SPECIFY) ____

5. EQUIPMENT MANUFACTURER ______IRD/PAT Traffic________________________________

WIM SYSTEM CALIBRATION SPECIFICS**

6.**CALIBRATION TECHNIQUE USED:
   ____ TRAFFIC STREAM ____STATIC SCALE (Y/N) __x_ TEST TRUCKS

   __ __ __ NUMBER OF TRUCKS COMPARED __ _2 __ NUMBER OF TEST TRUCKS USED

   __2_0__ PASSES PER TRUCK

   TYPE PER FHWA 13 BIN SYSTEM
   SUSPENSION: 1 - AIR; 2 - LEAF SPRING
   3 - OTHER (DESCRIBE)

TRUCK	TYPE	SUSPENSION
1	___9____	__1________________
2	___9____	__2________________
3	________	___________________

7. SUMMARY CALIBRATION RESULTS (EXPRESSED AS A PERCENT)
   MEAN DIFFERENCE BETWEEN ---
   DYNAMIC AND STATIC GVW ___ ___ _- 0 . 8_ STANDARD DEVIATION __ _2 . 7_
   DYNAMIC AND STATIC SINGLE AXLES ___ ___ _- 4 . 7_ STANDARD DEVIATION __ _2 . 6_
   DYNAMIC AND STATIC DOUBLE AXLES ___ ___ _- 0 . 1_ STANDARD DEVIATION __ _3 . 6_

8. ___3____ NUMBER OF SPEEDS AT WHICH CALIBRATION WAS PERFORMED

9. DEFINE THE SPEED RANGES USED (MPH) ______ _____45 , 55 , 65______ ______ ______ ______ ______
   ______ ______ ______ ______ ______ ______ ______ ______ ______ ______

10. CALIBRATION FACTOR (AT EXPECTED FREE FLOW SPEED) ___ __3_7_0_0___ ___

11.** IS AUTO-CALIBRATION USED AT THIS SITE? (Y/N) __N__
   IF YES, LIST AND DEFINE AUTO-CALIBRATION VALUE: ______________________________
   ____
   ____

CLASSIFIER TEST SPECIFICS***

12.*** METHOD FOR COLLECTING INDEPENDENT VOLUME MEASUREMENT BY VEHICLE CLASS:
___ VIDEO ___ MANUAL ___ PARALLEL CLASSIFIERS

13. METHOD TO DETERMINE LENGTH OF COUNT ____ TIME ____ NUMBER OF TRUCKS

14. MEAN DIFFERENCE IN VOLUMES BY VEHICLES CLASSIFICATION:
*** FHWA CLASS 9 ____ ____ ____ FHWA CLASS ____ ____ ____ ____ ____
*** FHWA CLASS 8 ____ ____ ____ FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
FHWA CLASS ____ ____ ____ ____ ____
*** PERCENT "UNCLASSIFIED" VEHICLES: ____ ____ ____

PERSON LEADING CALIBRATION EFFORT: _Dean J. Wolf, MACTEC Engineering ___________________________
CONTACT INFORMATION: ___301-210-5105____ rev. November 9, 1999

APPENDIX A

Sheet 19	* STATE CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

PART I.

1.* FHWA Class 9 2.* Number of Axles 5

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A				D / C
B				D / C
C				D / C
D				D / C
E				D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ______

*b) Average Pre-Test Loaded weight ______
*c) Post Test Loaded Weight ______
*d) Difference Post Test – Pre-test ______

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / Conventional b) * Sleeper Cab? Y / N

9. a) * Make: INTERNATIONAL b) * Model: 9900i

10.* Trailer Load Distribution Description:

tractor #456, trailer #94

milk

11. a) Tractor Tare Weight (units): ______

b). Trailer Tare Weight (units): ______

Sheet 19	* STATE_CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 15.1 B to C 4.3 C to D 28.6

D to E 4.3 E to F ______

Wheelbased (measured A to last) ______ Computed ______

13. *Kingpin Offset From Axle B (units) ______(+ 2.8)__

(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	1 full leaf, 1 tapered leaf
B	11R22.5	air
C	11R22.5	air
D	80R24.5	air
E	75R24.5	air
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE_CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Sheet 19	* STATE_CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 1	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 5. Raw data – Axle scales – pre-test - day 1 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10460	16710	16710	16060	16060	–	76000
2	10440	16720	16720	16050	16050	–	75980
3	10460	16710	16710	16060	16060	–	76000
Average	10450	16710	16710	16060	16060	–	75990
day 1 post	10060	16620	16620	16060	16060	–	75420

Table 6. Raw data – Axle scales – day 2 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10380	16710	16710	16050	16050	–	75900
2	10400	16700	16700	16060	16060	–	75920
3	10400	6700	16700	16060	16060	–	75920
Average	10390	16700	16700	16060	16060	–	75920
day 2 post	9880	16610	16610	16050	16050	–	75200

Table 7. Raw data – Axle scales – ~~post-test~~ day 3 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	10380	16700	16700	16050	16050	–	75880
2	10380	16690	16690	16050	16050	–	75860
3	10380	16710	16710	16050	16050	–	75900
Average	10380	16700	16700	16050	16050	–	75900
day 3 post	10160	16660	16660	16050	16050	–	75580

Measured By DAW Verified By ______

Sheet 19	* STATE_CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

PART I.

1.* FHWA Class 9 2.* Number of Axles 5

AXLES - units - lbs / 100s lbs / kg

	3. Empty Truck Axle Weight	4.* Pre-Test Average Loaded Axle Weight	5.* Post-Test Average Loaded Axle Weight	6.* Measured D)irectly or C)alculated?
A				D / C
B				D / C
C				D / C
D				D / C
E				D / C
F				D / C

GVW (same units as axles)

7. a) Empty GVW ________

*b) Average Pre-Test Loaded weight ________
*c) Post Test Loaded Weight ________
*d) Difference Post Test – Pre-test ________

GEOMETRY

8 a) * Tractor Cab Style - Cab Over Engine / Conventional b) * Sleeper Cab? Y / N

9. a) * Make: INTERNATIONAL b) * Model: 9900i

10.* Trailer Load Distribution Description:

tractor # 247, trailer # 82

rock

11. a) Tractor Tare Weight (units): ________

b). Trailer Tare Weight (units): ________

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Sheet 19	* STATE_CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

12.* Axle Spacing – units m / feet and inches / feet and tenths

A to B 15.1 B to C 4.3 C to D 16.0

D to E 4.2 E to F ______

Wheelbased (measured A to last) ______ Computed ______

13. *Kingpin Offset From Axle B (units) ______(+3.0)__
(+ is to the rear)

SUSPENSION

Axle	14. Tire Size	15.* Suspension Description (leaf, air, no. of leaves, taper or flat leaf, etc.)
A	11R22.5	1 full leaf, 1 tapered leaf
B	11R22.5	air
C	11R22.5	air
D	11R22.5	tapered leaf, 15 leaves
E	11R22.5	walker beam
F		

16. Cold Tire Pressures (psi) – from right to left

Steering Axle	Axle B	Axle C	Axle D	Axle E

Sheet 19	* STATE CODE	5 1
LTPP Traffic Data	* SPS PROJECT ID	0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

PART II

Table 1. Axle and GVW computations - pre-test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 2. Raw Axle and GVW measurements

Axles	Meas.	Pre-test Weight			Post-test Weight
A	I				
A + B	II				
A + B + C	III				
A + B + C + D	IV				
A + B + C + D + E (1)	V				
B + C + D + E	VI				
C + D + E	VII				
D + E	VIII				
E	IX				
A + B + C + D + E (2)	X				
A + B + C + D + E (3)	XI				

Table 3. Axle and GVW computations - post -test

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Sheet 19	* STATE_CODE 5 1
LTPP Traffic Data	* SPS PROJECT ID 0 1 0 0
*CALIBRATION TEST TRUCK # 2	* DATE 0 1 / 3 0 / 2 0 0 7

Rev. 08/31/01

Table 4 . Axle and GVW computations -

Axle A		Axle B		Axle C		Axle D		Axle E		GVW	
I		II -I		III -II		IV -III		V -IV		V	
V -VI		VI- VII		VII- VIII		VIII- IX		IX`		X	
										XI	
Avg.											

Table 5. Raw data – Axle scales – pre-test · day 1 pre

Pass	Axle A 11080	Axle B 13670	Axle C 13670	Axle D 13530	Axle E 13530	Axle F	GVW
1	11120	13710 ~~[illegible]~~	13710 ~~[illegible]~~	13480	13480	—	65500
2	~~[illegible]~~	12080 ~~[illegible]~~	12080 ~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	65500
3	11100	13630 ~~[illegible]~~	13630 ~~[illegible]~~	13580	13580	—	65520
Average	11080	13670	13670	13530	13530	—	65510
day 1 post -	10760	13310	13310	13760	13760	-	64900

Table 6. Raw data – Axle scales – day 2 pre

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11120 ~~10380~~	13680	13680	13500	13500	-	65480
2	11020 ~~10400~~	13280	13280	13940	13940	-	65460
3	11100 ~~10400~~	13700	13700	13480	13480	-	65460
Average	11080	13550	13550	13640	13640	-	65470
day 2 post	10620	13360	13360	13680	13680	-	64700

Table 7. Raw data – Axle scales – ~~post-test~~ day 3

Pass	Axle A	Axle B	Axle C	Axle D	Axle E	Axle F	GVW
1	11300	13400	13400	13710	13710	-	65520
2	11160	13480	13480	13700	13700	-	65520
3	11160	13470	13470	13700	13700	-	65500
Average	11210	13450	13450	13700	13700	-	65510
day 3 post	10940	13430	13430	13680	13680	-	65160

Measured By DAW Verified By ____________

Sheet 20	* STATE_CODE 5 1
LTPP Traffic Data	*SPS PROJECT_ID 0 1 0 0
Speed and Classification Checks * 1 of* 2	* DATE 0 1 / 3 0 / 2 0 0 7

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
67	9	48915	66	9	72	9	49103	70	9
64	8	48916	65	8	60	5	49110	62	~~6~~5
65	9	48920	66	9	63	9	49113	62	9
63	9	48925	62	9	59	9	49116	59	9
44	9	48936	44	~~44~~9	60	9	49120	60	9
45	9	48937	45	9	65	5	49156	65	5
59	9	48969	60	9	57	5	49161	56	5
70	9	48998	71	9	62	6	49172	63	6
62	6	49003	62	6	67	9	49200	67	9
59	9	49019	59	9	59	11	49201	59	11
66	9	49032	64	9	58	6	49211	58	6
60	9	49035	59	9	57	9	49217	57	9
65	9	49043	65	9	61	9	49219	61	9
62	9	49046	61	9	65	9	49223	65	9
48	6	49049	48	6	68	9	49224	67	9
60	9	49050	61	9	62	9	49227	62	9
60	5	49055	60	5	65	9	49233	65	9
64	9	49060	64	9	60	9	49234	60	9
68	9	49081	68	9	64	8	49235	64	8
67	9	49082	66	9	64	11	49239	64	11
64	9	49087	64	9	55	9	49240	55	9
58	9	49088	58	9	65	9	49249	64	9
60	5	49090	62	5	58	5	49283	57	5
67	9	49096	67	9	68	6	49284	69	6
65	6	49098	64	6	58	9	49292	56	9

Recorded by Ambie Direction S Lane 1 Time from 9:30a.m to 10:54a.m

Sheet 20	* STATE_CODE 51
LTPP Traffic Data	*SPS PROJECT_ID 0100
Speed and Classification Checks * 2 of* 2	* DATE 01 / 30 / 2007

Rev. 08/31/2001….

WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class	WIM speed	WIM class	WIM Record	Obs. Speed	Obs Class
62	9	49297	62	9	70	9	49494	69	9
58	9	49303	58	9	69	9	49496	69	9
60	6	49314	59	6	68	9	49497	68	9
55	11	49318	54	11	65	9	49516	65	9
59	9	49337	59	9	62	9	49527	62	9
55	6	49345	55	6	68	8	49530	68	8
59	9	49346	59	9	60	9	49531	60	9
69	9	49347	69	9	60	9	49532	59	9
63	9	49352	64	9	60	5	49542	60	5
65	9	49360	65	9	63	9	49543	62	9
63	9	49367	64	9	65	9	49568	64	9
63	9	49373	62	9	61	9	49572	61	9
65	9	49377	66	9	63	9	49587	62	9
67	9	49380	66	9	56	9	49638	56	9
60	5	49419	60	5	60	9	49641	61	9
68	9	49426	68	9	56	6	49643	56	6
62	11	49440	61	11	67	9	49647	66	9
67	9	49441	67	9	54	5	49651	54	5
59	6	49444	60	6	63	5	49656	64	5
61	9	49447	62	9	60	9	49660	59	9
64	9	49448	63	9	59	9	49664	59	9
63	9	49469	63	9	62	5	49703	61	5
66	9	49472	67	9	67	6	49707	65	6
59	6	49479	59	6	74	9	49713	74	9
67	9	49483	66	9	58	6	49718	57	6

Recorded by Ambie Direction S Lane 1 Time from 10:55a.m to 12:32p.m.

Sheet 21	* STATE_CODE	5 1
LTPP Traffic Data	*SPS PROJECT_ID	0 1 0 0
WIM System Test Truck Records 1 of 3	* DATE	0 1 / 3 0 / 2 0 0 7

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
28.5	44	1	1	9:37:50	48936	44	4.6/5.0 ~~14.9~~	8.3/9.2 ~~4.3~~	7.2/10.0 ~~28.5~~	6.8/9.7 ~~4.3~~	6.6/10.4		77.4 ~~80.0~~	14.9	4.3	28.5	4.3	
28.5	45	2	1	9:37:56	48937	45	5.5/5.5	6.1/8.2	6.1/7.1	5.5/9.0	6.1/5.8		64.8 ~~72.5~~	14.9	4.4	15.9	4.2	
33.0	52	1	2	9:51:28	49004	52	4.7/4.7	7.9/8.3	7.1/8.8	6.7/8.5	6.5/8.9		72.0	14.9	4.3	28.5	4.3	
33.0	54	2	2	9:51:30	49005	54	5.1/5.4	5.8/8.2	6.1/6.7	6.6/7.7	6.6/6.6		64.8	14.9	4.3	15.7	4.1	
36.0	60	1	3	10:05:03	49063	60	5.5/4.9	8.1/8.9	7.4/9.6	7.2/9.2	6.6/9.4		76.8	14.9	4.3	28.6	4.3	
36.0	60	2	3	10:05:04	49064	60	5.8/5.2	6.5/8.1	6.5/6.9	6.7/8.5	6.8/5.7		66.7	14.9	4.3	15.7	4.2	
34.5	45	1	4	10:18:18	49126	44	4.9/5.4	8.2/9.3	7.1/10.0	7.0/9.3	6.5/10.0		77.8	14.9	4.3	28.4	4.3	
34.5	44	2	4	10:18:31	49127	45	5.1/5.6	6.2/8.0	6.3/6.8	7.1/8.3	6.8/5.8		65.9	14.9	4.3	15.8	4.1	
38.3	52	1	5	10:32:00	49189	53	5.3/4.6	8.3/7.8	9.2/6.9	8.4/6.4	9.0/6.1		72.1	14.9	4.3	28.5	4.3	
38.3	53	2	5	10:32:02	49190	53	5.8/5.2	8.6/5.7	7.3/5.5	8.8/6.8	6.6/6.4		66.6	14.9	4.3	15.8	4.2	
40.0	62	1	6	10:45:55	49259	62	5.1/5.2	8.1/9.0	7.1/9.9	6.5/9.2	6.0/10.1		76.2	14.9	4.3	28.6	4.3	
40.0	62	2	6	10:45:56	49260	62	5.6/5.4	6.4/8.4	6.5/6.8	6.4/8.4	7.7/6.6		68.0	14.9	4.3	15.7	4.1	
40.1	43	1	7	10:59:41	49321	44	4.8/5.2	8.6/9.1	7.5/9.9	6.7/9.4	5.7/9.9		76.8	14.8	4.3	28.5	4.3	
40.1	44	2	7	10:59:43	49325	44	5.4/5.4	6.4/8.2	6.1/6.8	7.5/7.9	7.5/5.4		66.6	14.9	4.3	15.8	4.1	
40.0	54	1	8	11:13:23	49384	54	4.8/5.2	8.0/8.0	7.1/8.8	7.0/8.5	6.2/9.4		73.0	14.8	4.3	28.5	4.3	
40.0	53	2	8	11:13:24	49385	54	5.1/5.6	5.7/8.1	5.7/7.1	6.1/8.5	7.0/6.7		65.5	14.9	4.3	15.8	4.1	

Recorded by Andre   Checked by [signature]

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Lane - 1

Sheet 21	* STATE_CODE 51
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 01 / 30 / 2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
43.0	62	1	9	11:27:16 61	49447	61	5.1/5.1	8.1/9.0	7.2/9.8	7.0/10.0	6.3/9.7		77.3	14.9	4.3	28.5	4.3	
43.0	63	2	9	11:27:19 64	49448	64	5.5/5.2	6.6/8.0	6.7/6.9	7.2/8.4	7.8/6.0		68.4	14.9	4.3	15.7	4.2	
44.0	44	1	10	11:40:45	49500	44	5.3/5.4	8.4/9.1	7.1/10.0	6.2/9.9	5.9/10.3		77.8	14.9	4.3	28.6	4.3	
44.0	44	2	10	11:40:47	49501	45	5.3/5.4	6.5/7.9	6.4/7.0	5.9/8.2	7.6/6.0		66.1	14.9	4.3	15.8	4.1	
46.0	53	1	11	11:54:32	49554	52	4.8/5.2	8.1/8.2	7.0/8.8	6.7/8.7	6.4/9.1		72.9	14.9	4.3	28.5	4.3	
46.0	54	2	11	11:54:35	49555	54	4.9/5.6	5.8/8.2	6.1/7.1	6.1/8.2	6.6/6.8		65.5	14.9	4.3	15.8	4.1	
49.1	62	1	12	12:07:53	49610	61	5.4/5.0	7.9/9.2	7.2/10.0	7.2/9.7	6.5/10.1		78.2	14.9	4.3	28.5	4.3	
49.1	64	2	12	12:07:55	49611	65	5.6/5.1	6.6/7.8	6.5/6.9	5.9/8.2	7.2/6.5		66.2	14.9	4.3	15.8	4.1	
47.6	43	1	13	12:22:40	49666	43	4.8/5.5	8.3/9.1	7.4/10.0	7.0/9.0	6.1/10.1		77.3	14.9	4.3	28.6	4.3	
47.6	46	2	13	12:22:42	49667	47	5.6/5.5	6.7/7.9	6.0/6.8	5.2/8.6	7.0/5.7		64.9	14.9	4.3	15.9	4.1	
47.7	53	1	14	12:35:51	49731	52	4.9/4.8	8.0/8.6	7.1/9.2	6.9/8.4	6.1/8.9		72.8	14.9	43	28.4	4.3	
47.7	53	2	14	12:35:53	49732	52	5.3/5.0	6.3/8.3	6.2/7.0	6.9/8.5	6.8/6.6		66.8	14.9	4.3	15.7	4.1	
47.5	60	1	15	12:50:45	49795	60	5.2/4.7	8.5/8.8	7.5/9.6	7.4/8.9	6.4/9.4		76.4	14.9	4.3	28.6	4.3	
47.5	60	2	15	12:50:46	49797	61	5.6/5.0	6.7/8.2	6.6/6.4	6.1/7.9	7.2/5.6		65.3	14.8	4.3	15.8	4.1	
47.5	43	1	16	13:04:48	49853	44	4.5/5.3	8.4/9.2	7.3/10.1	7.0/10.0	7.0/9.1		77.8	14.9	4.3	28.5	4.3	
47.5	44	2	16	13:04:50	49854	45	4.8/5.2	6.4/8.3	6.5/6.9	6.0/8.3	8.2/5.9		66.4	14.9	4.3	15.9	4.1	

Recorded by Ambie   Checked by [signature]

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Lane-1

Sheet 21	* STATE_CODE 51
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 3	* DATE 01 / 30 / 2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
49.5	52	1	17	13:18:13	49910	52	4.7/4.9	8.3/8.7	7.2/9.1	6.6/8.6	6.4/9.0		73.4	14.8	4.3	28.5	4.3	
49.5	52	2	17	13:18:15	49911	52	5.2/4.8	6.2/7.2	6.1/7.2	7.0/7.2	7.2/6.1		64.2	14.9	4.3	15.8	4.1	
48.5	60	1	18	13:31:53	49971	59	5.4/4.9	8.2/9.1	7.2/10.0	6.7/9.0	6.0/9.7		76.1	14.9	4.3	28.6	4.3	
48.5	60	2	18	13:31:54	49972	60	5.6/5.4	6.3/8.4	6.2/6.9	5.9/8.3	7.1/5.8		66.1	14.9	4.3	15.8	4.1	
49.5	44	1	19	13:45:43	50036	44	4.6/4.8	8.2/9.3	7.3/10.0	7.4/9.4	6.8/10.1		77.9	14.9	4.3	28.5	4.3	
49.5	42	2	19	13:45:46	50037	43	5.0/5.3	6.2/8.1	6.5/7.2	6.6/8.5	7.4/6.1		66.9	14.9	4.3	15.8	4.1	
49.5	54	1	20	13:59:24	50109	54	4.7/5.4	7.2/8.4	6.6/9.3	6.4/8.0	6.0/8.4		70.2	15.0	4.3	28.6	4.3	
49.5	55	2	20	13:59:27	50110	56	4.7/5.4	5.8/8.2	6.4/7.0	6.3/8.7	7.8/6.6		66.9	14.9	4.3	15.8	4.1	
49.5	62	1	21	14:12:45	50154	62	4.9/5.0	8.7/8.9	7.5/9.6	7.3/9.8	6.3/9.7		77.4	14.8	4.4	28.4	4.3	
49.5	62	2	21	14:12:49	50155	60	5.7/5.1	6.6/8.2	6.9/7.0	6.9/7.7	7.5/5.5		67.2	14.9	4.3	15.8	4.1	

Recorded by Ambia

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1/R Lane-1

Sheet 21	* STATE_CODE 51
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 1 of	* DATE 01 / 31 / 2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
30	46	2	1	10:33:13	53912	47	5.0/5.2	6.9/8.1	6.8/6.8	7.4/8.2	7.1/5.3		66.1	14.9	4.3	15.8	4.1	
30	44	1	1	10:33:22	53913	43	4.7/5.2	8.3/9.3	7.3/10.1	7.4/9.4	6.1/9.8		77.7	14.9	4.3	28.5	4.3	
28.5	55	2	2	10:46:44	53979	55	4.9/5.3	5.5/8.4	6.1/7.2	6.5/8.6	7.6/5.7		65.7	14.9	4.4	15.8	4.1	
28.5	54	1	2	10:46:48	53981	53	4.9/4.5	8.1/8.2	6.8/8.7	6.5/8.2	5.5/8.7		70.2	14.9	4.3	28.6	4.3	
30.0	62	2	3	10:59:58	54047	62	5.6/5.0	6.5/8.1	6.5/6.4	7.3/8.0	6.8/6.0		66.3	14.8	4.3	15.7	4.1	
30.0	58	1	3	11:00:01	54048	60	5.2/5.0	8.2/8.9	7.4/9.6	6.4/8.8	6.6/10.3		76.5	14.8	4.3	28.6	4.3	
35.0	45	2	4	11:39:31	54210	45	5.6/5.5	6.6/8.3	6.1/7.0	5.9/8.1	7.2/6.4		66.7	14.9	4.3	15.8	4.2	
35.0	44	1	4	11:39:38	54212	44	5.2/5.2	8.6/8.9	7.6/9.8	6.9/9.1	6.5/10.0		77.6	14.9	4.3	28.5	4.3	
40.0	55	2	5	11:52:34	54267	55	4.8/5.6	5.3/8.4	6.2/7.0	6.3/8.5	7.0/6.4		65.6	14.9	4.3	15.8	4.1	
40.0	54	1	5	11:52:39	54268	53	5.0/4.8	7.8/8.2	6.6/8.9	6.2/8.8	5.5/9.0		70.8	14.9	4.3	28.6	4.3	
40.5	64	2	6	12:05:14	54328	63	5.5/4.9	6.1/7.8	5.3/5.8	4.6/8.3	5.9/6.6		60.7	15.0	4.3	15.8	4.1	
40.5	60	1	6	12:05:28	54329	59	5.4/4.8	8.2/8.8	7.2/9.6	7.0/9.2	6.4/9.3		75.9	14.9	4.3	28.6	4.3	
44.5	45	2	7	12:44:08	54486	46	5.5/5.4	6.5/8.0	6.2/6.8	6.0/8.2	6.8/5.6		65.0	14.8	4.3	15.8	4.1	
44.5	59	1	7	12:44:14	54487	60	5.0/5.1	8.4/8.9	7.6/9.6	6.6/9.2	6.8/9.7		76.8	14.9	4.3	28.5	4.3	
43.0	47	2	8	13:50:26	54768	47	5.9/5.3	6.2/8.0	6.4/7.0	6.6/8.5	7.7/5.9		66.6	14.9	4.3	15.8	4.1	
43.0	42	1	8	13:50:34	54769	42	4.6/5.2	8.3/9.2	7.3/10.1	6.8/9.2	6.2/10.1		77.1	14.9	4.3	28.5	4.3	

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Lane-1

Lane-1

Sheet 21	* STATE_CODE 51
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 2 of 3	* DATE 01 / 31 / 2007

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
44.0	55	2	9	14:04:13	54823	56	5.5/5.2	6.4/7.9	6.0/6.9	6.6/7.6	7.2/6.4		65.6	15.0	4.4	15.9	4.2	
44.0	54	1	9	14:04:17	54824	54	4.8/5.0	8.1/8.1	6.8/8.8	6.8/8.6	6.5/8.7		72.1	14.9	4.3	28.6	4.3	
44.5	60	2	10	14:17:36	54878	60	5.7/5.1	6.3/8.0	6.4/6.6	6.4/8.4	6.7/5.9		65.6	14.9	4.3	15.8	4.2	
44.5	65	1	10	14:17:39	54880	64	5.4/4.4	8.6/8.2	7.8/8.9	6.7/8.9	6.3/9.3		74.5	14.8	4.3	28.5	4.3	
41.5	48	2	11	15:09:42	55122	49	5.2/5.0	6.3/8.0	6.4/6.7	6.3/8.1	6.6/5.6		64.0	14.9	4.3	15.8	4.1	
41.5	45	1	11	15:09:46	55123	45	4.6/5.0	8.1/9.4	7.4/10.0	7.0/9.8	6.8/9.4		77.5	14.9	4.3	28.5	4.3	
41.5	55	2	12	15:22:31	55187	55	5.0/5.2	6.5/7.7	6.4/6.7	7.0/8.0	7.5/6.1		66.1	14.9	4.3	15.8	4.1	
41.5	55	1	12	15:22:36	55189	55	4.5/4.9	8.0/7.4	6.6/8.0	6.8/9.0	6.8/10.1		72.1	14.9	4.3	28.5	4.3	
36.5	63	2	13	15:35:37	55249	63	5.4/4.7	6.4/7.7	6.4/6.6	7.2/7.7	6.8/5.2		64.1	14.9	4.3	15.8	4.2	
36.5	64	1	13	15:35:39	55250	64	5.1/4.4	8.1/8.5	7.3/9.4	6.7/9.4	6.1/9.5		74.5	14.8	4.3	28.6	4.3	
31.5	49	2	14	16:26:51	55564	49	5.3/5.1	6.2/7.8	5.9/6.5	6.6/8.1	6.1/5.6		63.4	14.9	4.3	15.8	4.2	
31.5	45	1	14	16:27:03	55566	46	4.7/5.0	7.8/9.1	6.9/10.0	7.0/9.5	6.0/9.3		75.4	14.9	4.3	28.5	4.3	
02/01/07 29.0	45	2	15	8:13:31	58016	45	5.6/5.2	6.3/7.8	6.1/6.6	5.7/8.0	6.4/5.2		62.8	14.9	4.4	15.9	4.2	
29.0	45	1	15	8:13:38	58018	46	4.6/5.1	8.4/8.9	7.3/9.7	7.4/8.8	6.5/9.5		76.3	14.9	4.3	28.5	4.3	
30.0	54	2	16	8:26:42	58068	54	5.2/5.4	5.8/8.0	6.2/6.8	6.5/7.9	7.2/6.1		65.1	14.9	4.3	15.8	4.1	
30.0	55	1	16	8:26:46	58069	56	4.3/5.4	7.1/7.6	6.8/8.3	7.1/9.9	5.8/10.2		72.0	14.9	4.3	28.5	4.3	

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Lane-1

Lane-1

Sheet 21	* STATE_CODE 51
LTPP Traffic Data	*SPS PROJECT_ID 0100
WIM System Test Truck Records 3 of 3	* DATE 01 / 31 / 2007

02/01/07

Rev. 08/31/2001

Pvmt temp	Radar Speed	Truck	Pass	Time	Record No.	WIM Speed	Axle A weight.	Axle B weight.	Axle C weight.	Axle D weight.	Axle E weight.	Axle F weight	GVW	A-B space	B-C space	C-D space	D-E space	E-F space
30.5	60	2	17	8:39:55	58120	60	5.5/5.1	6.4/8.2	6.4/7.0	6.4/8.1	6.7/5.9		65.6	14.9	4.3	15.8	4.1	
30.5	58	1	17	8:39:57	58121	58	5.0/5.2	8.1/9.3	7.3/9.8	6.6/9.2	6.3/9.7		76.4	14.9	4.3	28.6	4.3	
30.5	53	2	18	9:33:09	58318	53	5.3/5.2	5.9/8.3	5.8/6.9	6.2/7.8	7.7/5.6		64.8	14.9	4.3	15.9	4.1	
36.5	55	2	18	9:46:16	58363	55	5.2/5.2	6.0/7.8	6.2/7.0	6.3/8.0	6.8/6.4		64.9	14.9	4.3	15.8	4.1	
36.5	50	1	18	9:46:29	58364	50	4.6/4.9	8.3/8.7	7.1/9.5	6.4/9.1	6.1/9.3		74.0	14.9	4.3	28.5	4.3	
33.0	67	~~1~~ 2	~~19~~ 20	9:59:10	58406	67	5.3/4.8	6.6/7.8	6.6/6.1	6.0/8.0	6.9/6.4		64.5	14.9	4.3	15.9	4.1	
27.5	65	2	21	10:27:56	58486	65	5.4/4.9	6.3/7.9	6.1/6.5	6.4/7.8	7.1/5.1		63.5	14.9	4.3	15.8	4.1	
27.5	59	1	19	10:28:17	58489	60	4.9/4.8	8.2/8.9	7.4/9.6	7.8/9.5	6.0/10.0		77.0	14.9	4.3	28.5	4.3	

Recorded by ____________ Checked by ____________

Lane-1

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

SITE EQUIPMENT INFORMATION

TYPE OF EQUIPMENT ___ WIM ___ VC _x_ BOTH

LANE NUMBER ON-SITE ____1_____ DIRECTION ON-SITE _____South______

VENDOR __IRD_____ MODEL _iSINC____ SERIAL NO. _060703525__

WEIGHING SENSOR TYPE __Bending Plate_

SYSTEM SOFTWARE VERSIONS:

CPU ___________

LOOP ___________

PIEZO ___________

WEIGHPAD/ LOAD CELL ___________

COMMUNICATION ___________

CLASSIFICATION VIDEO:

TIME FROM: ____________ TO: ______________

SITE CONDITIONS

PAVEMENT:

INDICATE ANY DEFICIENCIES THAT MAY AFFECT THE PERFORMANCE OF THE WIM SYSTEM. LIST ALL PHOTOS THAT SUPPORT THE EVALUATION.

None

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

IN-ROAD SENSORS:

DESCRIBE ANY DEFICIENCIES REGARDING THE SENSOR INSTALLATION. INDICATE SENSORS THAT SHOW ANY SIGN OF BEING BROKEN, SEVERELY WORN, MISSING, REMOVED OR LOOSE. LIST PHOTOS FOR EACH OCCURANCE.

None

TRUCK OBSERVATIONS

INDICATE ANY IRREGULAR TRUCK BEHAVIORS SUCH AS BOUNCING, SWERVING, OR BRAKING NEAR THE WEIGHING AREA (WITHIN 40 METERS). NOTE THE DISTANCE FROM THE WEIGHING SENSORS.

None

MINIMUM 15 MINUTE OR 35 TRUCK SAMPLE VIDEO FOR PAVEMENT INTERACTION – TAPE: ______________________________

FILE NAME: _____________________ TIME FROM: _____________ TO: _____________

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

CLASSIFICATION VERIFICATION VIDEO:

TAPE 1- NAME: ____

Interval 1 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 2 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 3 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 4 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 5 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 6 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 7 – FILE: ________________ TIME FROM: ______________ TO: _______________

TAPE 2- NAME: ____

Interval 1 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 2 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 3 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 4 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 5 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 6 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 7 – FILE: ________________ TIME FROM: ______________ TO: _______________

TAPE 3- NAME: ____

Interval 1 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 2 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 3 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 4 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 5 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 6 – FILE: ________________ TIME FROM: ______________ TO: _______________

Interval 7 – FILE: ________________ TIME FROM: ______________ TO: _______________

SHEET 22 **LTPP MONITORED TRAFFIC DATA**	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

SYSTEM ACCURACY TESTS

CONDUCT THE FOLLOWING SYSTEM ACCURACY TESTS EITHER ON-SITE OR IN OFFICE.

SPEED AND CLASSIFICATION – COMPLETE SHEET 20 AND ATTACH

AVERAGE DISTANCE BETWEEN AXLES OF DRIVE TANDEM _________ FT/ m

% ERROR FROM ___ (from system record average) FEET _________ % ERROR

SPEED ACCURACY mean difference _________ SD of mean _________

****Validation – see results******

WEIGHT – COMPLETE SHEET 21 AND ATTACH

AVERAGE FRONT AXLE WEIGHT FOR CLASS 9 VEHICLES _________ LBS/kg

% ERROR FROM 10,300/ _____________ (known site value) LBS _________ %

SUPPORT EQUIPMENT/STRUCTURES

INDICATE ANY DEFICIENCIES WITH ANY SITE EQUIPMENT OTHER THAN THE IN-ROAD SENSORS. LIST PHOTOS OF EACH OCCURANCE.

CABINET/FOUNDATION NONE __x__

PULL-BOXES NONE __x__

MAST NONE __x__

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

SOLAR PANELS NONE _N/A_

TELEPHONE D-MARK BOX NONE __x__

POWER SERVICE BOX NONE __x__

GROUNDING NONE _____

Loops not grounded or shielded from one another in cabinet

CONDUIT NONE __x__

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

STATIC EQUIPMENT VALUES (SYSTEM OFF)

POWER

SOLAR PANEL _______ WATTS _______ VDC

AC _120.7 _ VAC

BATTERY 1 _13.6 __ VDC

BATTERY 2 _______ VDC

REGULATED _______ VDC

POWER SUPPLY _11.8 __ VDC

SYSTEM INPUT _120.7 _ VDC

MODEM POWER _120.7 _ VAC _______ VDC

TELEPHONE _51.4 __ VDC

LOOP SENSORS

L1 (LEAD) RES __.7 ___ Ω; IND _______ Uh; SHLD __14 ___ MΩ

L2 (TRAIL) RES __.6 ___ Ω; IND _______ Uh; SHLD __14 ___ MΩ

WEIGHPAD SENSORS

WP1 (LEAD) INPUT __972 __ Ω; OUTPUT __847 __ Ω; SHLD __inf __ MΩ

WP2 (TRAIL) INPUT __973 __ Ω; OUTPUT __847 __ Ω; SHLD __inf __ MΩ

PIEZO SENSORS

PZ1 (LEAD) RES _______ Ω; CAP _______ Nf

PZ2 RES _______ Ω; CAP _______ Nf

PZ3 RES _______ Ω; CAP _______ Nf

PZ4 (TRAIL) RES _______ Ω; CAP _______ Nf

LOAD CELL SENSORS

LC1 (LEAD) INPUT _______ Ω; OUTPUT _______ Ω; SHLD _______ MΩ

LC2 (TRAIL) INPUT _______ Ω; OUTPUT _______ Ω; SHLD _______ MΩ

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

KISTLER SENSORS

K1 (LEAD L) RES _______ Ω; CAP _______ Nf

K2 (LEAD ML) RES _______ Ω; CAP _______ Nf

K3 (LEAD MR) RES _______ Ω; CAP _______ Nf

K4 (LEAD R) RES _______ Ω; CAP _______ Nf

K5 (TRAIL L) RES _______ Ω; CAP _______ Nf

K6 (TRAIL ML) RES _______ Ω; CAP _______ Nf

K7 (TRAIL MR) RES _______ Ω; CAP _______ Nf

K8 (TRAIL R) RES _______ Ω; CAP _______ Nf

DYNAMIC EQUIPMENT VALUES (SYSTEM ON)

LOOP SENSORS

L1 (LEAD) FREQ __12.4 _ KHz;

L2 (TRAIL) FREQ __12.4 _ KHz

WEIGHPAD SENSORS

WP1 (LEAD) ZERO POINT _0.0 ___ Mv

WP2 (TRAIL) ZERO POINT _0.1 ___ Mv

PIEZO SENSORS

PZ1 (LEAD) AMPLITUDE (CLASS 9) _______ Mv

PZ2 AMPLITUDE (CLASS 9) _______ Mv

PZ3 AMPLITUDE (CLASS 9) _______ Mv

PZ4 (TRAIL) AMPLITUDE (CLASS 9) _______ Mv

LOAD CELL SENSORS

LC1 (LEAD) ZERO POINT _______ Mv

LC2 (TRAIL) ZERO POINT _______ Mv

SHEET 22 LTPP MONITORED TRAFFIC DATA	* STATE CODE [_5_1_] * SPS PROJECT ID [_0_1_0_0_]
SITE EQUIPMENT ASSESSMENT	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) _0_1_ / _3_0_ / _2_0_0_7_

ADDITIONAL COMMENTS

- trucks bouncing at transition 313' prior to site

- amenities are located in Danville, approximately 8 miles south of site

- weighscales at CAT Scales (BP Gas Station, Kangaroo Express). Approximately 4 miles north of site

- lane 1 – low GVW for Truck 1 at 55 mph

Assessor: __Dean J. Wolf______________________

Rev. 11/12/2003

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SHEET 23 LTPP MONITORED TRAFFIC DATA	* STATE CODE [5 1] * SPS PROJECT ID [0 1 0 0]
WIM SYSTEM TROUBLESHOOTING OUTLINE	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) 0 1 / 3 1 / 2 0 0 7

PROBLEM REPORT DATE: 1/31/07 TIME: 9:00 am

SITE # 510100

LANE # 1/2 LANE DIRECTION South

STEP 1 – PROBLEM DESCRIPTION

PROVIDE A DETAILED DESCRIPTION OF THE PROBLEM.

When tankers, trucks w/ high trailers or skeleton trailers pass, the loops kick off under the trailer causing errors w/ the records

STEP 2 – COLLECT SYSTEM DATA

2A – SYSTEM PARAMETERS

REVIEW ALL EQUIPMENT OPERATIONAL PARAMETERS SUCH AS CLASSIFICATION ALGORITHMS, DATE/TIME, WEIGHT AND SPEED/SPACING ERROR COMPENSATION FACTORS, AS WELL AS SENSOR LANE ASSIGNMENTS AND THRESHOLD SETTINGS.

MAKE NOTE OF ANY SUSPECT VALUES. DO NOT CHANGE ANY VALUES AT THIS TIME.

Assessor: DNW

SHEET 23 LTPP MONITORED TRAFFIC DATA	* STATE CODE [51] * SPS PROJECT ID [0100]
WIM SYSTEM TROUBLESHOOTING OUTLINE	* STATE ASSIGNED ID [____]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) 01 / 31 / 2007

2B – DOWNLOAD SYSTEM DATA

DOWNLOAD SYSTEM TRAFFIC DATA FOR THE DAY OR TIME PERIOD IN QUESTION. SITE PROBLEMS THAT CAN ONLY BE DETERMINED BY REVIEWING DATA FILES WILL MOST LIKELY REQUIRE A SECOND VISIT UNLESS THE FILES CAN BE PROCESSED ON SITE.

2C – RECORD SYSTEM DIAGNOSTIC MODE VALUES

RECORD ALL SENSOR VALUES GIVEN IN THE SYSTEMS' DIAGNOSTIC MODE FOR THE LANE BEING INVESTIGATED IF AVAILABLE. MAKE NOTE OF ANY DEFICIENCIES OR SUSPECT OR INCONSISTENT VALUES.

LOOP SENSORS

LOOP	VALUE
LEADING	
TRAILING	

WEIGHPAD/LOAD CELL SENSORS

SENSOR	VALUE
LEADING	
TRAILING	

PIEZO SENSORS

PIEZO	VALUE
LEADING	
2nd	
3rd	
TRAILING	

KISTLER QUARTZ SENSORS

SENSOR	VALUE
LEADING	
TRAILING	

Assessor: DJW

SHEET 23 LTPP MONITORED TRAFFIC DATA	* STATE CODE [51] * SPS PROJECT ID [0100]
WIM SYSTEM TROUBLESHOOTING OUTLINE	* STATE ASSIGNED ID [____]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) 01/31/2007

TEMPERATURE

30°

NOTES:

loop frequencies are all the same for each lane

lane 1 = 12 khz

lane 2 = 10 khz

all loops read 14M to ground

STEP 3 – FINDING THE SOURCE OF THE PROBLEM

3A – PROBABLE FAULTY FUNCTION

LIST THE DEFICIENCIES DISCOVERED IN STEPS 1 & 2 BELOW. INDICATE THEIR ASSOCIATED WIM SYSTEM PRIMARY FUNCTIONS (POWER, COMMUNICATIONS, WEIGHT & CLASSIFICATION, EC.)

SYMPTOM	FUNCTION
loops drop out	class & weighing

BASED ON THE SYMPTOMS LISTED ABOVE, MAKE A CONCLUSION AS TO THE MOST PROBABLE FAULTY SYSTEM FUNCTION. ADD ANY CLARIFYING NOTES.

PROBABLE FAULTY FUNCTION

class & weighing

Assessor: DJW

SHEET 23 LTPP MONITORED TRAFFIC DATA	* STATE CODE [5_] * SPS PROJECT ID [0100]
WIM SYSTEM TROUBLESHOOTING OUTLINE	* STATE ASSIGNED ID [____]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) 01/31/2007

3B – FAULTY COMPONENT

USE THE STANDARD EQUIPMENT MAINTENANCE FORM (SHEET 22) TO RECORD ALL SYSTEM COMP[ONENT STATIC AND DYNAMIC VALUES USING THE TEST POINTS INDICATED BELOW FOR THE SYSTEM FUNCTION IN QUESTION.

TP#	TEST POINT DESCRIPTION	SYSTEM FUNCTION
1	WIM SYSTEM POWER INPUT	POWER
2	DC MODEM INPUT	POWER/ COMMUNICATION
3	TEL SURGE SUPPRESSOR OUTPUT	COMMUNICATION
4	TEL TERMINAL STRIP OUTPUT	COMMUNICATION
5	TEL D-MARK BOX OUTPUT	COMMUNICATION
6	SENSOR TERMINAL STRIP INPUTS	CLASSIFICATION AND WEIGHING
7	PULL BOX INPUTS	CLASSIFICATION AND WEIGHING
8	DC POWER TERMINAL STRIP OUTPUTS	POWER
9	DC REGULATOR OUTPUT	POWER
10	BATTERY OUTPUT	POWER
11	SOLAR SURGE SUPPRESSOR OUPUT	POWER
12	SOLAR PANEL OUPUT	POWER
13	AC POWER TERMINAL STRIP	POWER
14	AC SERVICE DROP OUTPUT	POWER
15	AC CIRCUIT BREAKER OUTPUT	POWER
16	AC OUTLET OUTPUT	POWER
17	EXTERNAL POWER SUPPLY OUTPUT	POWER

BASED ON THE TEST READINGS MADE, DRAW A CONCLUSION AS TO THE MOST PROBABLE FAULTY COMPONENT AND INDICATE BELOW.

FAULTY COMPONENT

loops (lead-in)

Assessor: DJW

SHEET 23 LTPP MONITORED TRAFFIC DATA	* STATE CODE [5 1] * SPS PROJECT ID [0100]
WIM SYSTEM TROUBLESHOOTING OUTLINE	* STATE ASSIGNED ID [_ _ _ _]
LTPP LANE ONLY	* DATE: (mm/dd/yyyy) 01 / 31 / 2007

STEP 4 – DETERMINE THE CORRECTIVE ACTION

CONSIDERING ALL FACTORS ASSOCIATED WITH THE REPAIR OF THE FAULTY COMPONENT, DETERMINE THE CORRECTIVE ACTION.

DESRIBE THE CORRECTIVE ACTIONS TAKEN BELOW.

replace loop input wires w/ shielded 2 conductor lead-in cable from pull box to termination

STEP 5 – REPAIRING THE SYSTEM

DESCRIBE THE ACTIONS TAKEN TO REPAIR THE SYSTEM, OR MAKE RECOMMENDATIONS ON THE REPAIRS THAT NEED TO BE TAKEN TO CORRECT THE SYSTEM DEFICIENCY.

reported to G. Myers w/ IRD

Assessor: DJW

System Operating Parameters

Virginia SPS-1 (Lane 1)

Validation Visit – 30 January, 2007

Calibration factor for sensor #1:

72 kph:	3700
88 kph:	3700
105 kph:	3700
121 kph:	3700
137 kph:	3700

Calibration factor for sensor #2:

72 kph:	3700
88 kph:	3700
105 kph:	3700
121 kph:	3700
137 kph:	3700

ETG LTPP CLASS SCHEME, MOD 3

Class	Vehicle Type	No. Axles	Spacing 1	Spacing 2	Spacing 3	Spacing 4	Spacing 5	Spacing 6	Spacing 7	Spacing 8	Gross Weight Min-Max	Axle 1 Weight Min *
1	Motorcycle	2	1.00-5.99								0.10-3.00	
2	Passenger Car	2	6.00-10.10								1.00-7.99	
3	Other (Pickup/Van)	2	10.11-23.09								1.00-7.99	
4	Bus	2	23.10-40.00								12.00 >	
5	2D Single Unit	2	6.00-23.09								8.00 >	2.5
2	Car w/ 1 Axle Trailer	3	6.00-10.10	6.00-25.00							1.00-11.99	
3	Other w/ 1 Axle Trailer	3	10.11-23.09	6.00-25.00							1.00-11.99	
4	Bus	3	23.10-40.00	3.00-7.00							20.00 >	
5	2D w/ 1 Axle Trailer	3	6.00-23.09	6.30-30.00							12.00-19.99	2.5
6	3 Axle Single Unit	3	6.00-23.09	2.50-6.29							12.00 >	3.5
8	Semi, 2S1	3	6.00-23.09	11.00-45.00							20.00 >	3.5
2	Car w/ 2 Axle Trailer	4	6.00-10.10	6.00-30.00	1.00-11.99						1.00-11.99	
3	Other w/ 2 Axle Trailer	4	10.11-23.09	6.00-30.00	1.00-11.99						1.00-11.99	
5	2D w/ 2 Axle Trailer	4	6.00-26.00	6.30-40.00	1.00-20.00						12.00-19.99	2.5
7	4 Axle Single Unit	4	6.00-23.09	2.50-6.29	2.50-12.99						12.00 >	3.5
8	Semi, 3S1	4	6.00-26.00	2.50-6.29	13.00-50.00						20.00 >	5.0
8	Semi, 2S2	4	6.00-26.00	8.00-45.00	2.50-20.00						20.00 >	3.5
3	Other w/ 3 Axle Trailer	5	10.11-23.09	6.00-25.00	1.00-11.99	1.00-11.99					1.00-11.99	
5	2D w/ 3 Axle Trailer	5	6.00-23.09	6.30-35.00	1.00-25.00	1.00-11.99					12.00-19.99	2.5
7	5 Axle Single Unit	5	6.00-23.09	2.50-6.29	2.50-6.29	2.50-6.30					12.00 >	3.5
9	Semi, 3S2	5	6.00-30.00	2.50-6.29	6.30-65.00	2.50-11.99					20.00 >	5.0
9	Truck+FullTrailer (3-2)	5	6.00-30.00	2.50-6.29	6.30-50.00	12.00-27.00					20.00>	3.5
9	Semi, 2S3	5	6.00-30.00	16.00-45.00	2.50-6.30	2.50-6.30					20.00 >	3.5
11	Semi+FullTrailer, 2S12	5	6.00-30.00	11.00-26.00	6.00-20.00	11.00-26.00					20.00 >	3.5
10	Semi, 3S3	6	6.00-26.00	2.50-6.30	6.10-50.00	2.50-11.99	2.50-10.99				20.00 >	5.0
12	Semi+Full Trailer, 3S12	6	6.00-26.00	2.50-6.30	11.00-26.00	6.00-24.00	11.00-26.00				20.00 >	5.0
13	7 Axle Multi's	7	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00			20.00 >	5.0
13	8 Axle Multi's	8	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00		20.00 >	5.0
13	9 Axle Multi's	9	6.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	3.00-45.00	20.00 >	5.0

Spacings in feet
Weights in kips (Lbs/1000)
* Suggested Axle 1 minimum weight threshold if allowed by WIM system's class algorithm programming

TEST TRUCK PHOTOS FOR SPS WIM FIELD VALIDATION

STATE: Virginia

SHRP ID: 510100

Figures

Figure 1 – Truck_1_Tractor_TO_16_51_2.75_0100_01_30_07.jpg

Figure 2 – Truck_1_Trailer_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 3 – Truck_1_Suspension_1_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 4 – Truck_1_Suspension_2_3_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 5 – Truck_1_Suspension_4_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 6 – Truck_1_Suspension_5_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 7 – Truck_2_Tractor_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 8 – Truck_2_Trailer_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 9 – Truck_2_Suspension_1_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 10 – Truck_2_Suspension_2_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 11 – Truck_2_Suspension_4_ TO_16_51_2.75_0100_01_30_07.jpg

Figure 12 – Truck_2_Suspension_5_ TO_16_51_2.75_0100_01_30_07.jpg